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Report on a Game Survey of

ILLINOIS

Submitted to the Game Restoration Committee

Sporting Arms & Ammunition Manufacturers' Institute

by

Aldo Leopold

May 1, 1929

# P R E F A C E

This report is based on three weeks field work. It is increasingly apparent that this is too short a time to get to the bottom of even those problems which require merely the collection of data (as distinguished from real research). Nevertheless the framework of the report is that suitable for a more exhaustive survey. Such a framework has been deliberately chosen in the hope that some competent person or institution will see fit to fill in the missing detail. The Institute will gladly co-operate to this end.

Several regions have been left uncovered: (1) The region of the lower Rock River and Upper Mississippi; (2) The middle Mississippi from Quincy to Alton; (3) The Kankakee country; (4) The Galesburg region; (5) The lower Wabash; (6) The Vandalia region.

Wherever these omissions have been felt to cast a doubt on the conclusions reached, that fact is pointed out and the need for additional work emphasized.

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GAME SURVEY OF ILLINOIS

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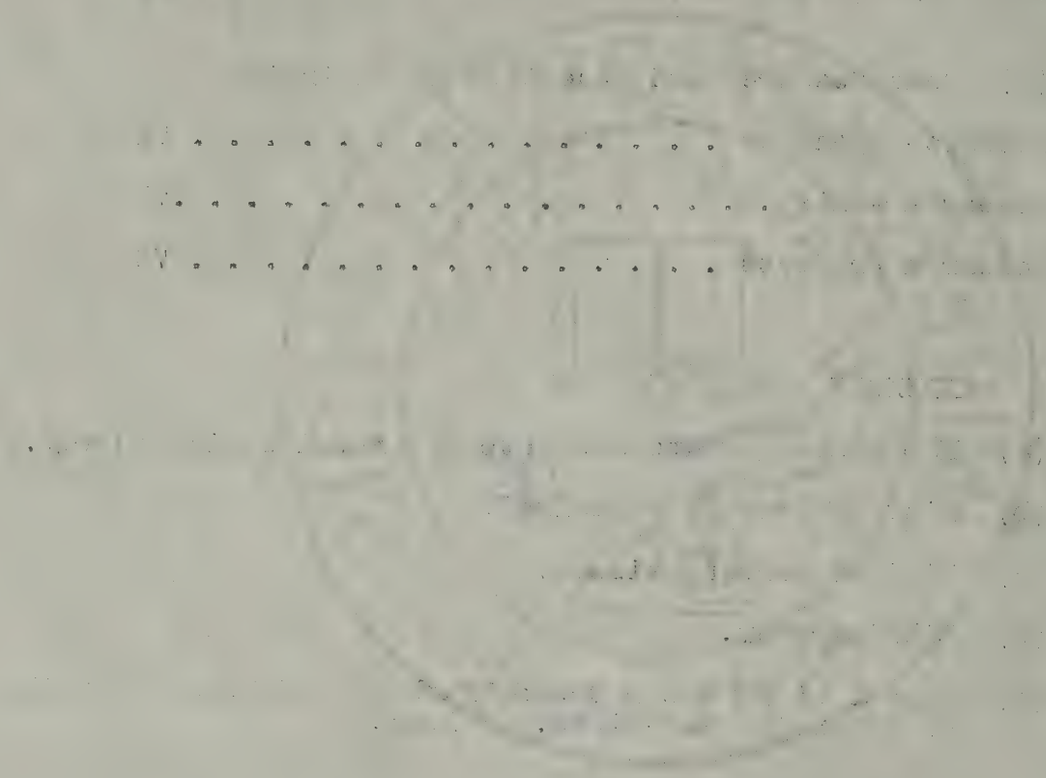


# I DESCRIPTIONS

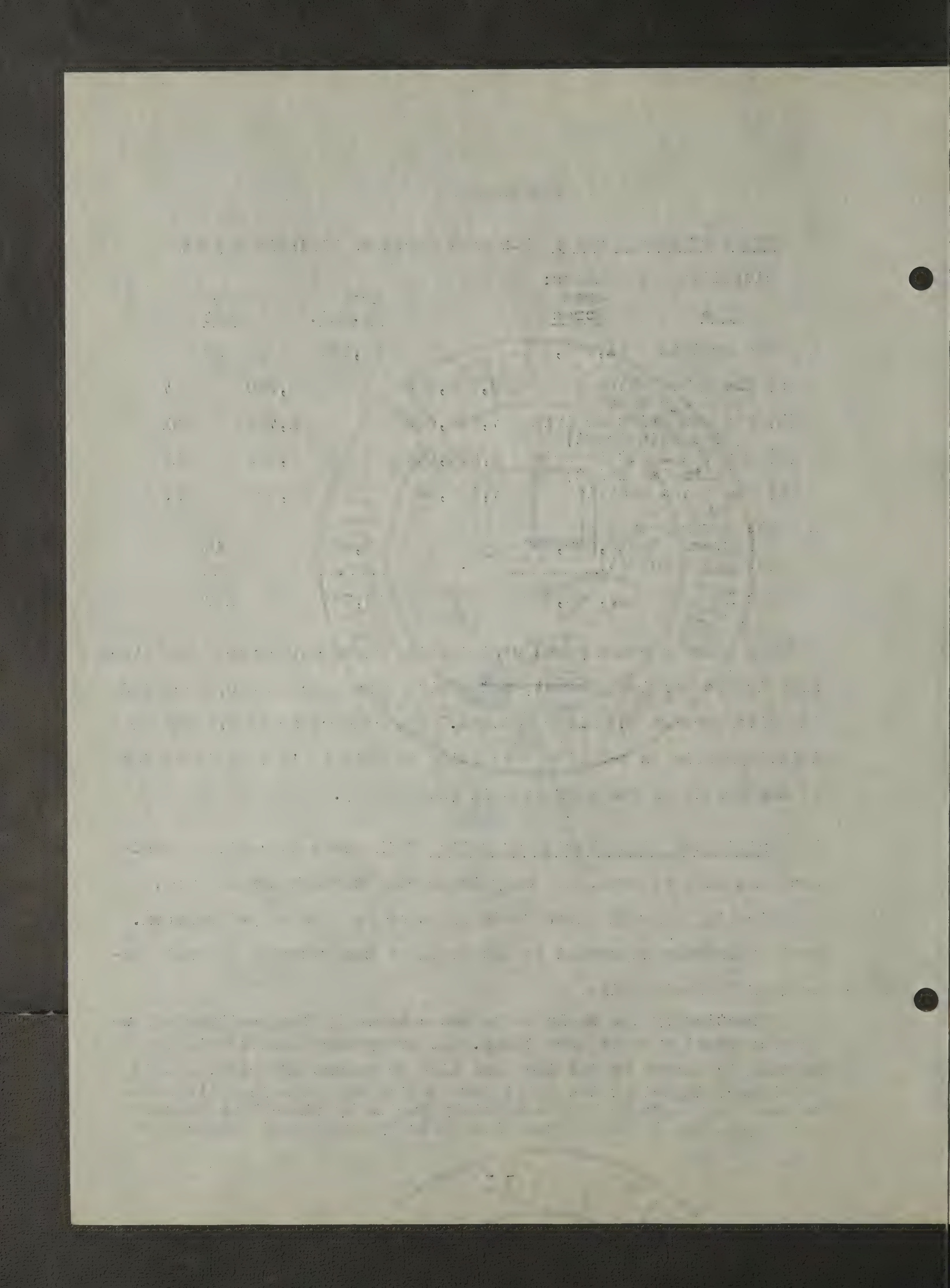
1 Types of Game Country. For game purposes Illinois may be classified as follows:

| | Type | Area Acres | Area Sq. Mi. | Per Cent |
|---|---|---|---|---|
| 1 | The Prairie | 21,000,000 | 32,900 | 58 |
| | (a) The Lake Region (Chicago area) | 2,500,000 | 3,900 | 7 |
| | (b) The New Drift Prairie (Wisconsin Drift) | 7,500,000 | 11,700 | 21 |
| | (c) The Old Drift Prairie (Illinoian Drift) | 4,000,000 | 6,300 | 11 |
| | (d) The Loess Prairie | 7,000,000 | 11,000 | 19 |
| 2 | The River Breaks & Bottoms (original forest) | 15,000,000 | 23,300 | 42 |
| | Total | 36,000,000 | 56,200 | 100 |

Map A shows roughly the distribution of forest cover. The black area is the original forest, which with a few exceptions, occupied the river breaks and river bottoms. The colored areas are the original prairie, sub-divided according to Leighton's classification of the origin of the surface soil (see Map G).

2 Origin and Distribution of Soils. Soil seems to control abundance and kind of game, not only indirectly through agriculture, but directly through plant foods or other factors as yet unknown. It is therefore important to set forth at the outset a general picture of Illinois soils.

Practically the whole state was covered by the southward-flowing ice sheet once or more times. Not everywhere, however, did the melting ice leave behind the same kind or amount of drift. What is still more important, the drift left behind when the ice melted was subsequently more or less completely buried by wind-blown loess, and this loess was in turn mixed with drift by subsequent advances of



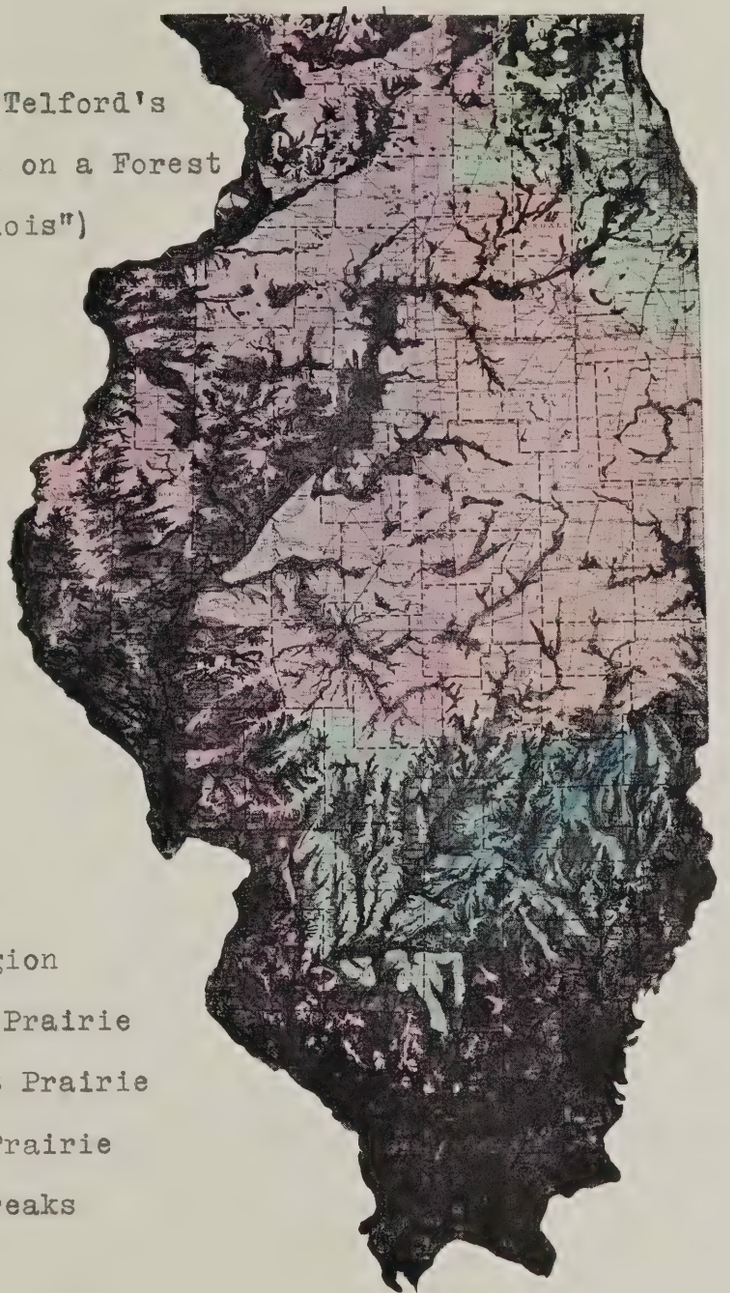
Map A

TYPES OF GAME COUNTRY

Game Survey of Illinois

Aldo Leopold, May 1, 1929

(Base map from Telford's " Third Report on a Forest Survey of Illinois")



- Legend -

Green: Lake Region

Red: New Drift Prairie

Blue: Old Drift Prairie

Purple: Loess Prairie

Black: River Breaks

the ice, and also more or less we shed away by subsequent erosion, thus re-exposing the buried drfit, especially along the rivers and creeks.

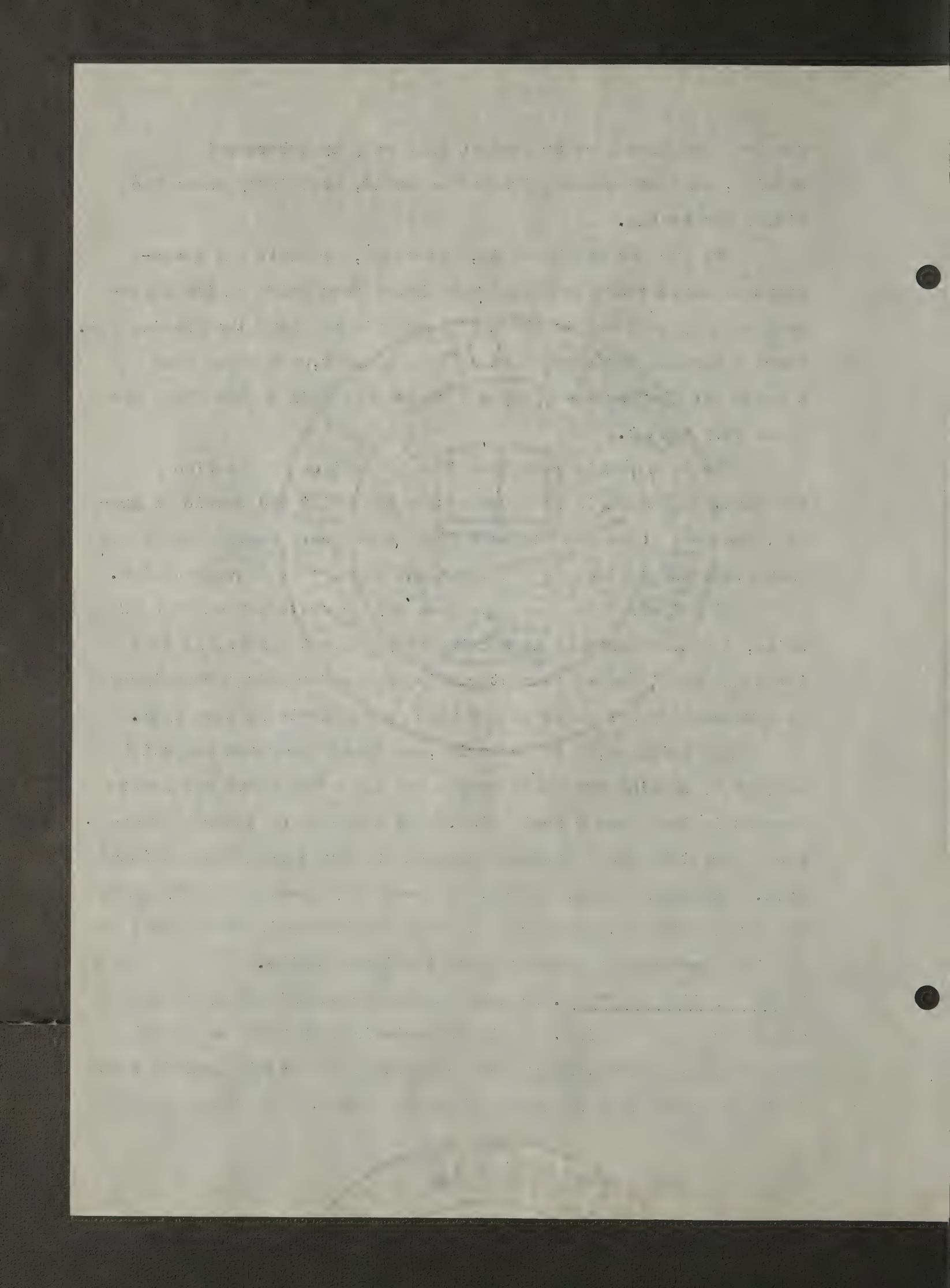
The surface of the state, therefore, presents all gradations of mixture of the soils from almost pure drift in the Chicago area to pure loess in the driftless fringes along the Mississippi. Where a moraine projects above a loess blanket,or a creek cuts through the blanket,the changes from the one soil to the other are often very abrupt.

The loess,while resulting from the action of the wind on the glacial outwash,is much finer than the drift and devoid of gravel. The pure loess and the pure drift each carry their distinctive plants,but these,like the soil,show all degrees of intergradation.

It follows from the above that any accurate correlation of soils,plants,and animals is a labor of years,not months,and that the soils mentioned as characteristic of the foregoing broad types of game country are merely those which predominate in that type.

M M Leighton,State Geologist,has kindly prepared a special map(Map C) showing the drift sheets and the areas where the loess blanket is less than 5 feet thick.There would be no general exposure of drift by small drainage channels in areas of greater thickness. Local exposures,however, may occur anywhere,especially along the larger streams. The moraines shown on the map in some places do and in others do not project above the loess mantle.

3 Description of Types.The lake region around Chicago(type a)has almost pure drift soils. It is characterized by numerous gravel moraines,oak covered,and projecting above a black-soil prairie which is interspersed with numerous lakes and swamps.Some of the swamps

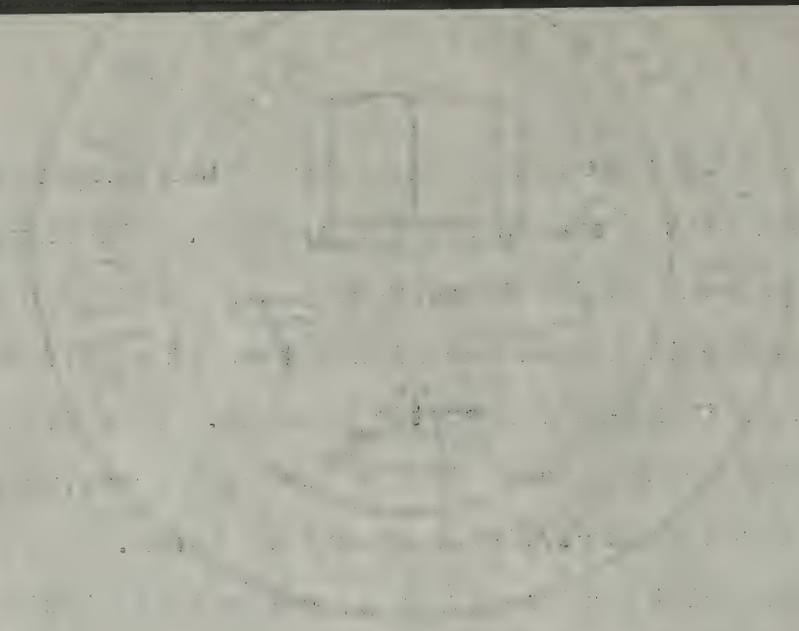


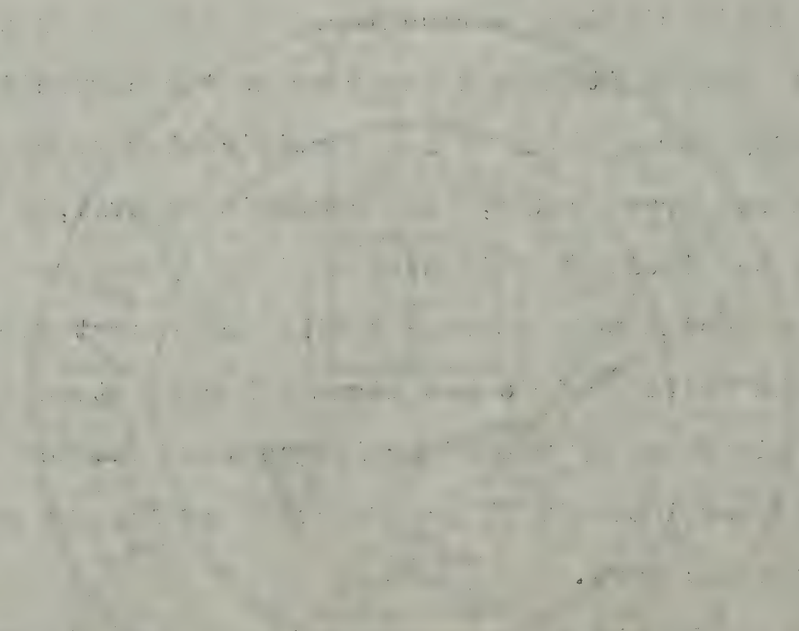
are peaty; all of them all of them form "hummocks", especially when grazed. Most of the swamps are now drained. The lakes have marshy shores. This lake region is perfectly distinctive in its topography and flora, hence it is not surprising that it should differ from other types as an environment for exotic species. This is a dairy region, and is heavily grazed except in the suburban areas, where idle real estate furnishes an exceptional amount of cover.

The New Drift Prairie (type b) can not be distinguished from the loess prairie (type c) except by its fewer and shallower river breaks and the lesser thickness of the loess blanket. Both have rich black soil, so valuable for agriculture that not only have the interspersed river breaks been largely cleared of woodland and the remainder cleaned by pasturing, but even the artificially planted hedges on the prairie itself have been uprooted to make more room for corn. This prairie, especially type b, originally contained many marshy areas all of which all of which are now drained (see Map J.) the original prairie sod is all gone. Where the land has any slope at all, erosion is bad, considering the high value of the land. We have here, in short, one of the most highly artificialized agricultural landscapes in North America. The more one studies it, the stronger grows the conviction that this strong tendency for agricultural intensification to remove every vestige of tree and grass cover, is a competitive evil, in the sense that what profits the individual is what ultimately damages the community. The reasoning behind this statement will be brought forth later.

The Old Drift Prairie has light colored instead of black soil, and is more dissected by wooded drainages than the new drift. Agriculture is much less intensive, hence fencerow covers and even weedy fields are not uncommon.

The river breaks (black areas on Map A) are characterized by





limestone outcrops and deep loess soil, both increasing westerly. This type, originally all wooded(with the exception of a few bottomland prairies on the upper Mississippi) is now 30% cleared(Telford, 1926) and the remaining 20% is almost all so heavily pastured that the undergrowth has disappeared and the forest is prevented from reproducing when it is cut. This grazing out of undergrowth is less pronounced toward the extreme southern tip of the state,and in the northwest corner.

Map J shows how nearly universally the larger river bottoms have been dyked and drained. In 1920,75% of the total area in"need" of drainage (or 14% of the state) has been drained (Pickels and Leonard,1921). The river bottoms must be nearly 90% drained at this time. Clearing,of course,accompanies drainage.

4 Crops and Industries Affecting Game (see Map B)

Dairying predominates in the lake region.Steer and hog feeding predominates in all the other types,especially the prairie types.

Both of these industries tend to remove game cover,but the latter has the offsetting advantage of leaving the corn(either with or without the ears) standing over winter in the field to be pastured by cattle and hogs. If it were not for this standing corn the entire prairie region (over half the state) would already be devoid of game. This offsetting advantage is not necessarily permanent.The advance of the corn-borer,pulping markets for cornstalks,or silo development may,any or all of them, alter the practice at any time. The restoration of streambank and fencerow coverts is therefore in the game sense,an emergency measure. If not carried out, and area twice the size of Massachusetts may become entirely naked during the critical winter and spring seasons, and hence not only gameless,but also devoid of those song and insectivorous birds which winter here and de-

# Map B : Crops and Industries Affecting Game

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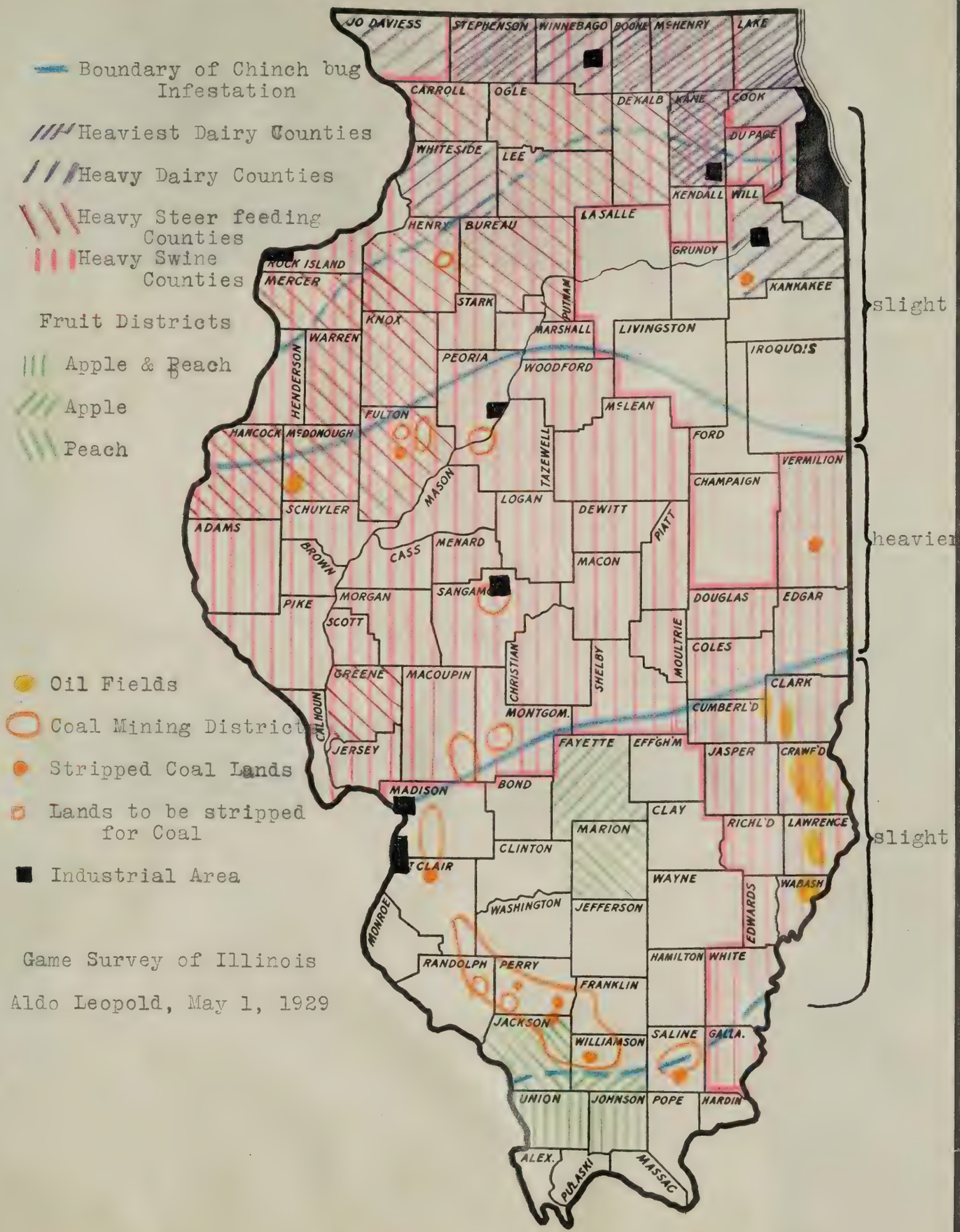



Game Survey of Illinois

Aldo Leopold, May 1, 1929

Stripped Coal Lands near Danville, Illinois

Photos Courtesy of R B Miller, State Forester.

(This photo not in original paper)

pend on ground cover.

There is a thriving orchard section on the loess soils of southern Illinois. This hilly region with its deep soil and the necessity of clear cultivation is especially subject to erosion. The finding of suitable plants to give maximum protection to drainage channels and minimum harborage to noxious insects is here, as elsewhere, an important research problem.

The stripped coal lands (see Map B for location and photograph for appearance) are suitable only for reforestation. They will ultimately provide good coverts, but they are mostly located in the sections least in need of additional wooded area. Some of these lands (as at Danville) will hold water can can be made to furnish a new kind of artificial marshland.

Oil lands, like idle real estate, usually have good cover, but this is about offset by the accompanying human population.

5 Suitability of Types for Game. The lake region (type a) is adapted to all of the native species of upland game. It is also the only region where the exotic species so far tried (ringneck pheasant and Hungarian partridge) really thrive. The limiting factor is clearly lack of cover, except on suburban real estate, where there is much cover but little grain feed. But for drainage and lack of refuges this region would also be a good waterfowl country.

The New Drift Prairie (type b) supports a bare sprinkling of pheasant, quail, and chicken, and a few rabbits. The limiting factor is cover. With more cover this could become fairly productive of quail, rabbit and chicken, and there is no apparent reason why it should not become productive of pheasants. It resembles north Iowa, where pheasants are abundant.

The same is true of the Loess Prairie (type d) and the Old Drift Prairie (type c) except that these are potentially better for quail

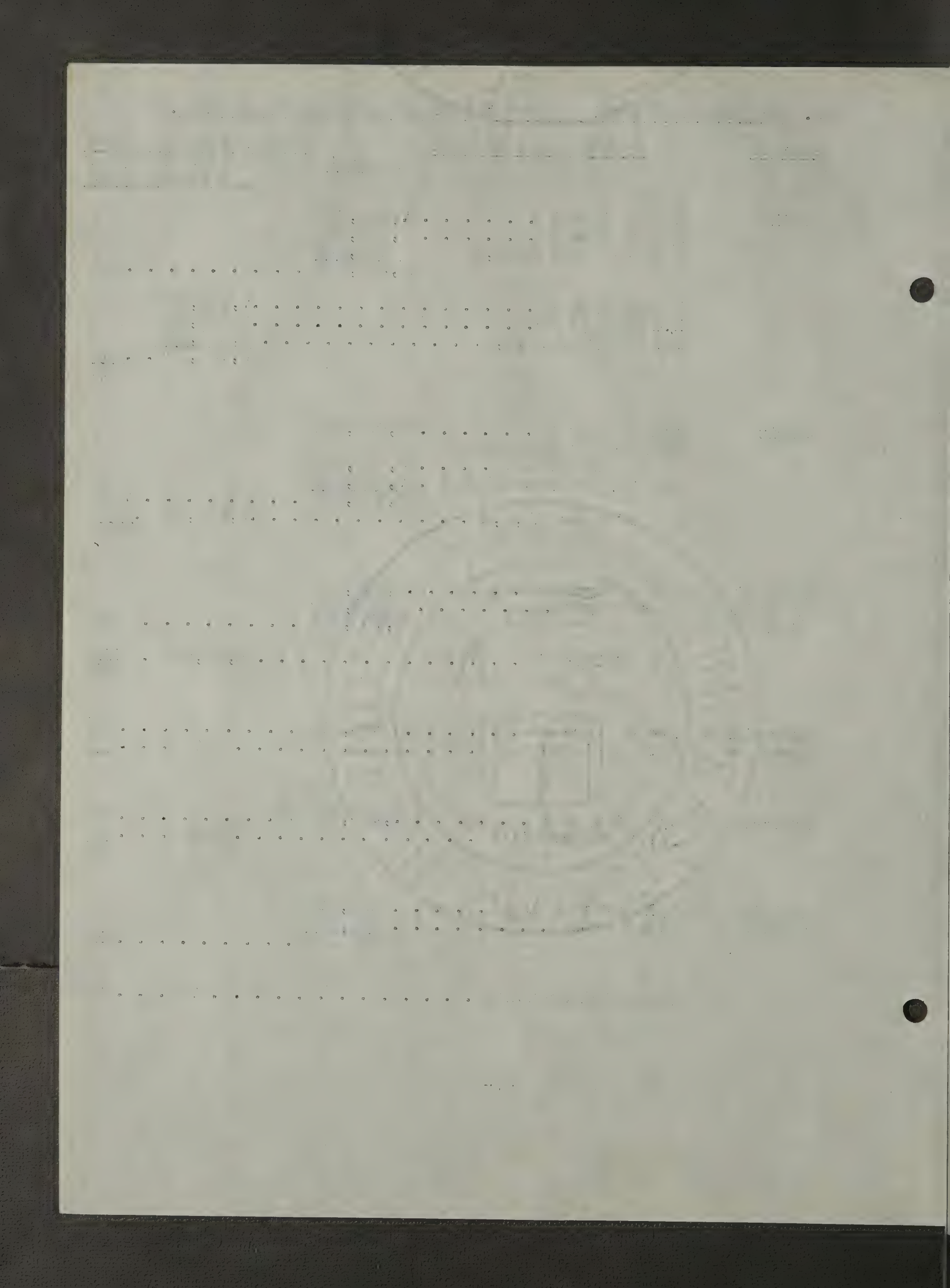
(by reason of greater dissection) and poorer for pheasant (by reason of fainter glaciation).

The River Breaks of Illinois (type 2) have a higher capacity for quail production than any land so far found anywhere. They are equally good for rabbit and squirrel. The limiting factor is cover.

The undrained remnants of the larger river bottoms are now probably the most valuable large blocks of waterfowl land in America. Lack of refuges is their greatest present drawback.

6. Acreage of Present & Estimated Potential Range by Species.

| Species | Type or Part of Type | Present | Range, Acres, Estimated Potential Additional | % of State |
|---|---|---|---|---|
| Quail | 1/2 of type 2 | 7,500,000 | | |
| | 1/4 of type c | 2,000,000 | | |
| | 1/20 of types la,b,d | 850,000 | | |
| | | 10,350,000 | | .30% |
| | 1/2 of type 2 | | 7,500,000 | |
| | 1/4 of type lc | | 2,000,000 | |
| | 1/4 of types la,b,d | | 4,250,000 | |
| | | | 13,750,000 | .38% |
| | | | | 68% |
| Rabgit | All of type 2 | 15,000,000 | | |
| | Holing-up range, type la & N part of ld | 5,000,000 | | |
| | 1/2 (?) of types lb,c,d | 7,000,000 | | |
| | | 28,000,000 | | 78% |
| | 1/4 of types lb,c,d | | 3,500,000 | .10% |
| | | | | 88% |
| Pheasant (in wild state) | 1/2 of type la | 1,200,000 | | |
| | Other types | 500,000 | | |
| | | 1,700,000 | | 5% |
| | 1/2 of type lb | | 4,000,000 | 11% |
| | | | | 16% |
| Hungarian Partridge | 1/4 of type la | 600,000 | | 2% |
| | Potential addition | | ? | ? |
| | | | | ? |
| Squirrel | 1/5 of type 2 | 3,000,000 | | 8% |
| | Potential addition | | none | 0 |
| | | | | 8% |
| Prairie Chicken | 1/10 of type la | 250,000 | | |
| | Other types | 250,000 | | |
| | | 500,000 | | 1% |
| | Potential addition | | ? | ? |



## II ANALYSIS

### (A) The Game Situation in Illinois

7. Summary. Quail are by far the most important and valuable game resources. They have not lost any range in the sense of being wiped out of any large blocks of country, but the proportion of the total area capable of supporting quail is gradually shrinking. This shrinkage is greatest in the prairie types, but is serious in all types. Small areas which have accidentally retained good cover indicate that Illinois is capable of raising a heavier quail crop and sustaining a heavier kill than the best of the South.

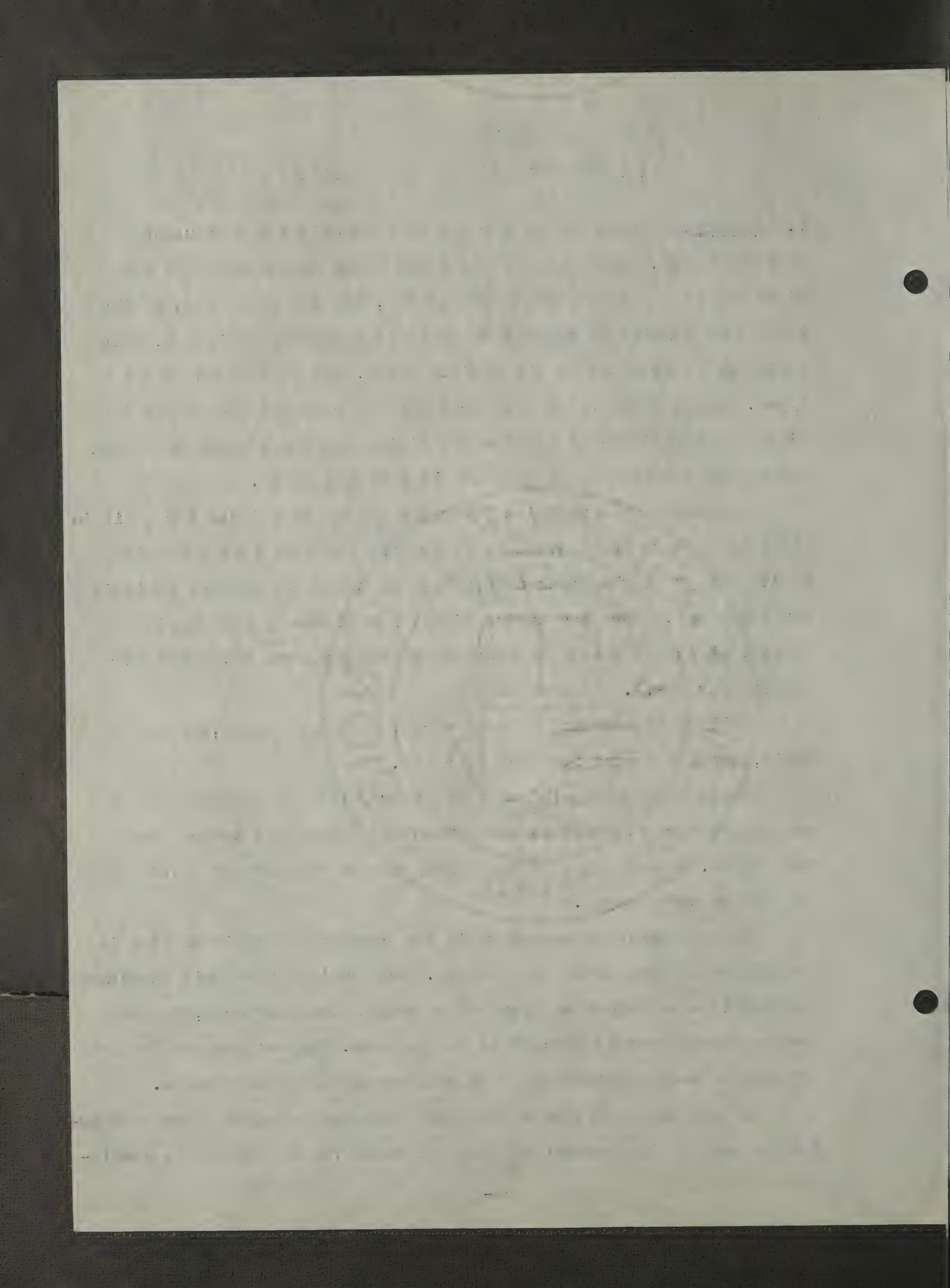
Pheasants and Hungarian partridge are no substitute for quail in Illinois. There is no evidence to sustain the hope that they will thrive except in the Northeastern part of the state and the Illinois River bottoms. Since the northeast section is the poorest quail ground, pheasants should be regarded as a supplement to, not a substitute for, quail.

Rabbits are holding up well except in the prairies, where, like quail, they are scarce for lack of cover.

There is a surprising survival of remnants of prairie chicken and ruffed grouse. There is one remnant of turkey and several small deer herds. Prairie chicken and turkey can be retained if given proper protection and refuges.

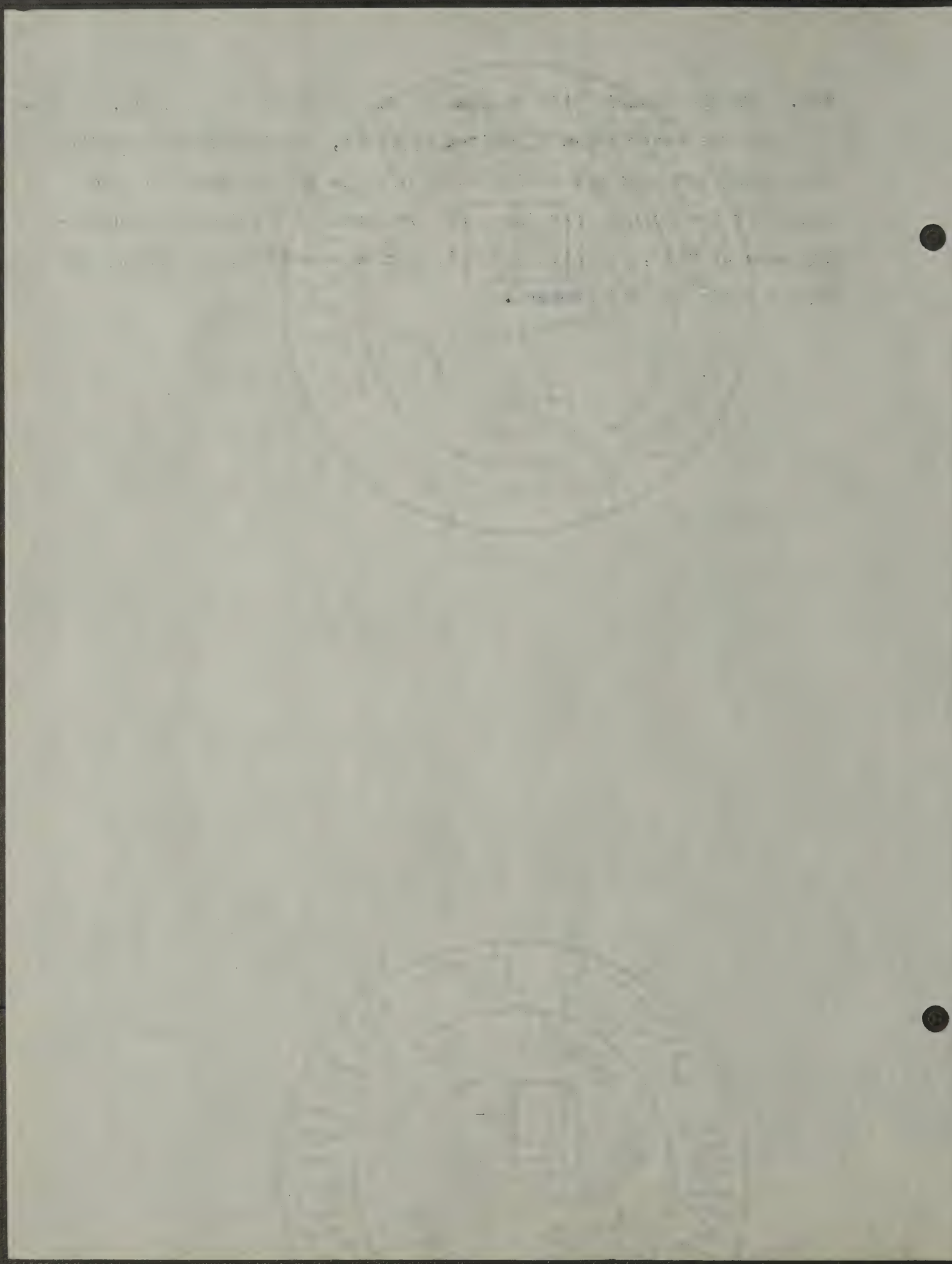
The abundance of waterfowl in the remnants of their habitat is leading to a false sense of security. Many realize that this abundance represents a shrinkage of area rather than a thriving crop, but few realize the degree to which this is the case. Many abuses and few real efforts at conservation are found on these concentration areas.

By and large, Illinois game will continue to suffer a net shrinkage as long as the present approach to conservation problem is contin-



ued. On the prairie this shrinkage will approach actual zero.

On the other hand, a revised approach, dealing primarily with conserving the land and making it a suitable environment for game holds out the hope of retaining all the present species and increasing some of them, especially quail, pheasant, rabbit, and turkey, far beyond their present numbers.



## 8. Quail

Taxonomy. Ridgeway (1895) says that small dark-colored quail prevail in southern Illinois. These have large bills and arboreal habits, including the habit of whistling from the tops of tall trees. Nelson referred these to the Florida subspecies, but Ridgeway considers them intermediate.

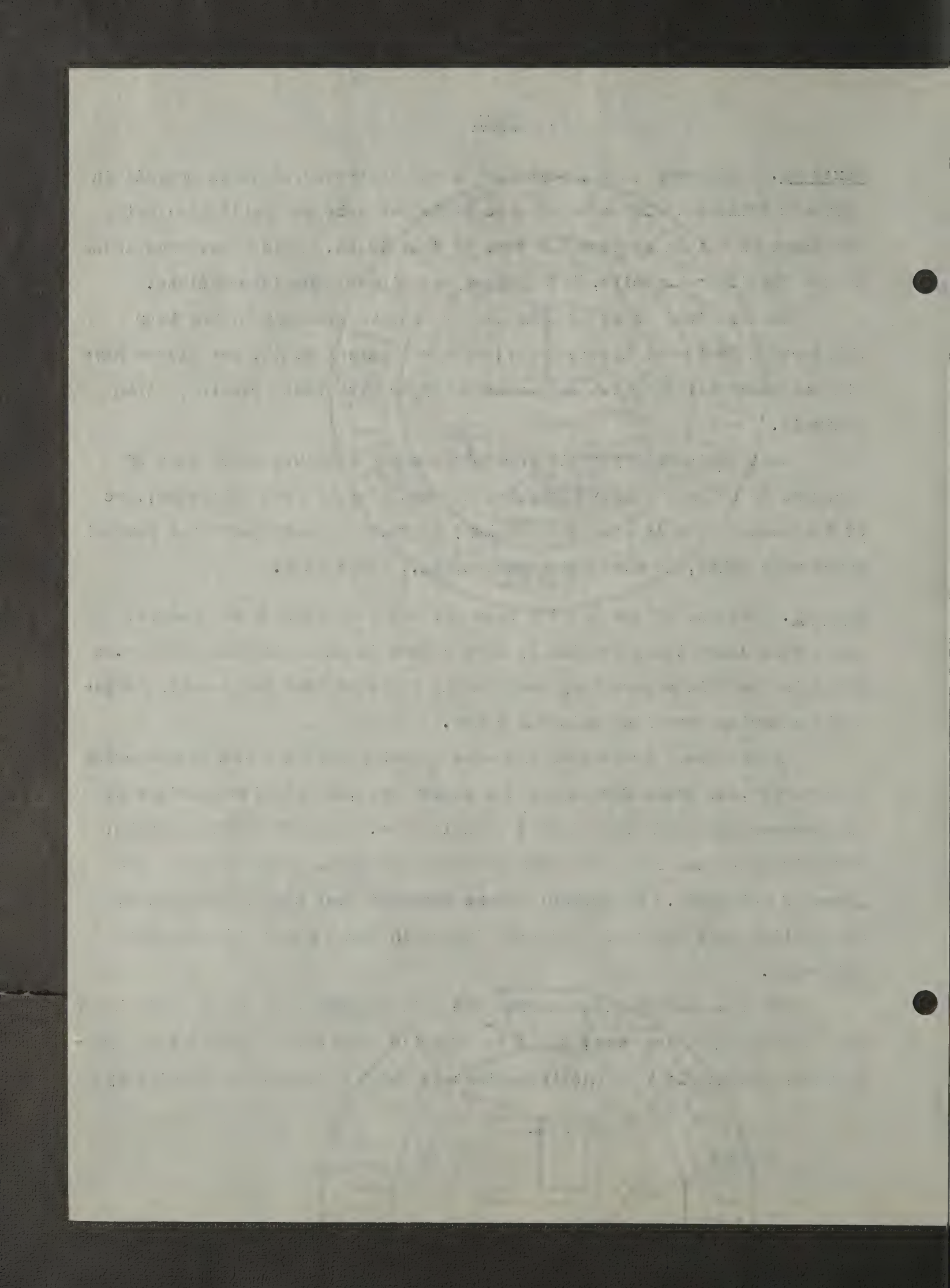
The original forms of Illinois quail have probably by now been obliterated by the wholesale importation of Mexican stock. Few states have diluted their native blood so persistently, or with less occasion, than Illinois.

California Valley quail were planted about 1910, 3 miles east of Richmond in McHenry County and persisted until about 1920 (Eldredge). One of the western quails (probably Valley) is known to have persisted several years near Velie, Iowa, opposite Nauvoo, Ill., about 1895.

History. Because of the greater area and wider dispersion of prairie, quail were undoubtedly originally more common in Illinois than in Ohio. As noted in the Ohio report, they were hardly found in that state until large-scale clearings provided suitable range.

As in Iowa, a tremendous increase probably followed the introduction of clearing, and grain farming in the timber type, and the introduction of hedge cover and grain feed in the prairie type. Woodruff (1907) remarks: "Of late years the range has been gradually extended westward along the lines of railroads." He probably means westward over the plains states, and implies that the quail followed the grain farms which followed the railroads.

The increase of quail during the initial period of crude agriculture was followed by a decrease, the date of which varies with the date of agricultural intensification and the extent to which this was accompanied by



over-shooting. Nelson (1877) says of quail:"Still a common resident(in NE Illinois). . .Exceedingly numerous in southern Illinois." One may infer from this that the decrease in the northeastern section begin in the seventies no sooner, whereas it is common knowledge that it did not begin in southern Illinois until the end of the century.Huff says it began about 1905, and that a low ebb was reached in 1912. By 1917 there was a partial recovery. Bowman says that Shelby County held up until 1924,but was heavily shot out in 1925 and 1926.

There possibly never were a great many quail in the Lake region of northeast Illinois. Walker (1897) reports them rare in Boone County, and this is till the case.

Present Status by Types. (see Map C)

At Belvidere in Boone County, Rowan says one can find 2 or 3 coveys in a day. Progressing eastward to Waukegan in Lake County,Brewer says there are only a few coveys in the county. In McHenry County Nadelhoffer,a farmer, knows of no quail.Progressing southward to Sycamore,Wetzel knows of 10 coveys within a 6 miles radius. Sycamore and Belvidere are on the exact boundary of the Lake region.

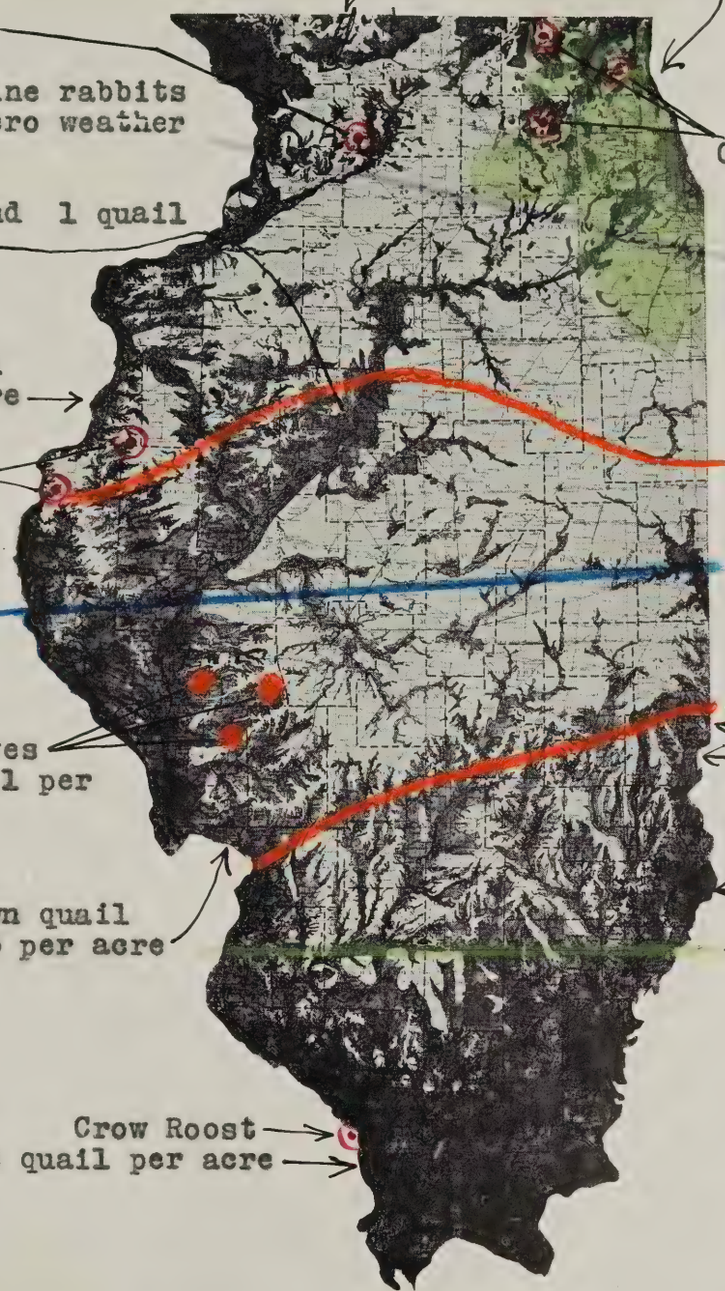
Not only is there this sharp boundary between the quail and pheasant country,but there is also,in both the northern counties of Illinois and the southern counties of Wisconsin a gradual decrease in quail eastward and increase westward to a degree not quite accounted for by the difference in coverts.

One might infer that quail have some aversion to glaciated country, but for their relative abundance in the distinctly glaciated parts of southern Michigan, and their fondness for pothole swamp cover in that state.

In a broad way,quail are most abundant in the river breaks(type 2) and decreasingly so in 1c, 1d, 1b, and 1a in the order named. In fact type 2

Map C

# QUAIL MAP OF ILLINOIS


Best ground 1 quail per 5 acres
Good pheasant but poor quail ground- only a few per square mile in green zone
Crow Roost
Above this line rabbits hole up in zero weather
Crow Roosts
Typical ground 1 quail per 6 acres
Corn Borer "Front" 1928
Best ground 1 quail per acre
Crow Roosts
Heavy Chinch Bug Zone
1 quail per 50 on this line in 1906
Quail Preserves (Best ground 1 per 1.5 acres)
Typical ground 1 quail per 2 acres
Heaviest known quail population: 3 per acre
Average ground 1 quail per 6 acres
Winter losses rare below this line
Crow Roost
Best ground 2 quail per acre

Note: Except in the green zone the proportion of quail ground in any region varies as the amount of black on this map.

TABLE D. ---Quail census and kill, Illinois

| Observer - Place - County | Acreage | Year | Population | | | | Kill | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Coveys | Per covey | Birds | Acres per bird | Kill | Acres per bird | Per cent |
| C F Mansfeld, Jr | 435 | 1907 | 8 | | 120 | 3.6 | | | |
| Preserve (owned) Green county | | 1926 | 21 | | 315 | 1.4 | | | |
| Leased | 2400 | Best year average | | | | | 1300 600 | 1.8 4.0 | |
| N R Huff | 640 | 10 years | 5 | | 75 | 8.0 | | Closed to hunting | |
| Farm, Hamilton county | (This is a sample of unproductive quail land.) | | | | | | | | |
| Wayne County | 10 | Several yrs | 3 | | 45 | 0.3 | ? | ? | |
| | (This is the heaviest stocked range Huff knows of.) | | | | | | | | |
| H J Bowman | 220 | 1921 | 4 | 20 | 80 | 2.7 | Closed to hunting since 1921. | | |
| Fairmont property, Madison county | | 1924 | 50 | 20 | 1000 | 0.2 | Always fed in winter. Killed a few cats. | | |
| | | 1928 | 15 | 20 | 300 | | | | |
| H J Bowman | 115 | 1916 | 12 | 20 | 240 | 0.5 | | | |
| Kirsch property, Madison county | | 1928 | 18 | 20 | 360 | 0.3 | 100 | 1.1 | 28 |
| | | Best year | 18 | 20 | 360 | 0.3 | 250 | 0.5 | 70 |
| | | | | | | | Fed in winter. Ten cats per yr. | | |
| John M Olin | 150 | 1925 | 9 | 20 | 180 | 0.8 | 150 | 1.0 | 80 |
| Kirsch and part of Fairmont property Madison county | | 1926 | 9 | 20 | 180 | 0.8 | 150 | 1.0 | 80 |
| | | 1927 | 9 | 20 | 180 | 0.8 | 150 | 1.0 | 80 |
| | | | | | | | | | Fed in winter. Killed 6 -10 cats per yr |
| Ed L Kanaker | 29 | 1928 | 4 | 15 | 60 | 0.5 | Closed for years. Fed winters. | | |
| Kanaker homestead, Union county | | | | | | | | | |
| D R Abernathy | 1000 | 1928 | 13 | 12 | 156 | 6.4 | | | |
| Lawrence county | (This is average Lawrence County quail country.) | | | | | | | | |

(cont'd.)

Table D. --Quail Census and kill, Illinois (cont.)

| Observer - Place - County | Acreage | Year | Population | | | | Kill | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Coveys | Per covey | Birds | Acres per bird | Kill | Acres per bird | Per cent |
| C E Huff<br>Elder Lee farm, Clark county | 160 | 1928 | 5 | 15 | 75 | 2.1 | 35<br>(A little better than average.) | 4.0 | 50 |
| C E Huff<br>Edgar County | 160 | 1927 | 5 | 15 | 75 | 2.1 | | | |
| M M Baker<br>County place, Peoria county (14 miles west of Peoria | 640 | 1928 | 5 | 20 | 100 | 6.4 | No shooting allowed.(Thinks this is a little better than average of local quail range.) | | |
| Frederic Leopold,1 mi.south of Hopper<br>Henderson county | 160 | 1928 | 8 | 20 | 160 | 1.0 | At least 60<br>This is a sample of the best range.)<br>(1/3 cult,2/3 brambly slashed timber. Been heavily trapped. Fox but no cats.) | | |
| Wm Eronger<br>Tom Gilbrath farm, Henderson county | 350 | 1928 | | | 500 | 0.7 | No shooting allowed.(This is a sample of the best range.) | | |
| L C Dadent<br>Dadent farm, Hancock county | 80 | 1928 | 4 | 15<br>24 survived | 60<br>winter | 1.3 | (Brushy land,small fields) | | |
| Kenneth Knowlton<br>Stephenson county | 160 | 1928 | 3 | 12 | 36 | 4.5 | This is a sample of the best stocking in this county. | | |

contains the heaviest populations so far found (3 per acre), while type 1a, as already pointed out, the poorest, runs as low as a dozen covies to the county, or 1 bird per square mile.

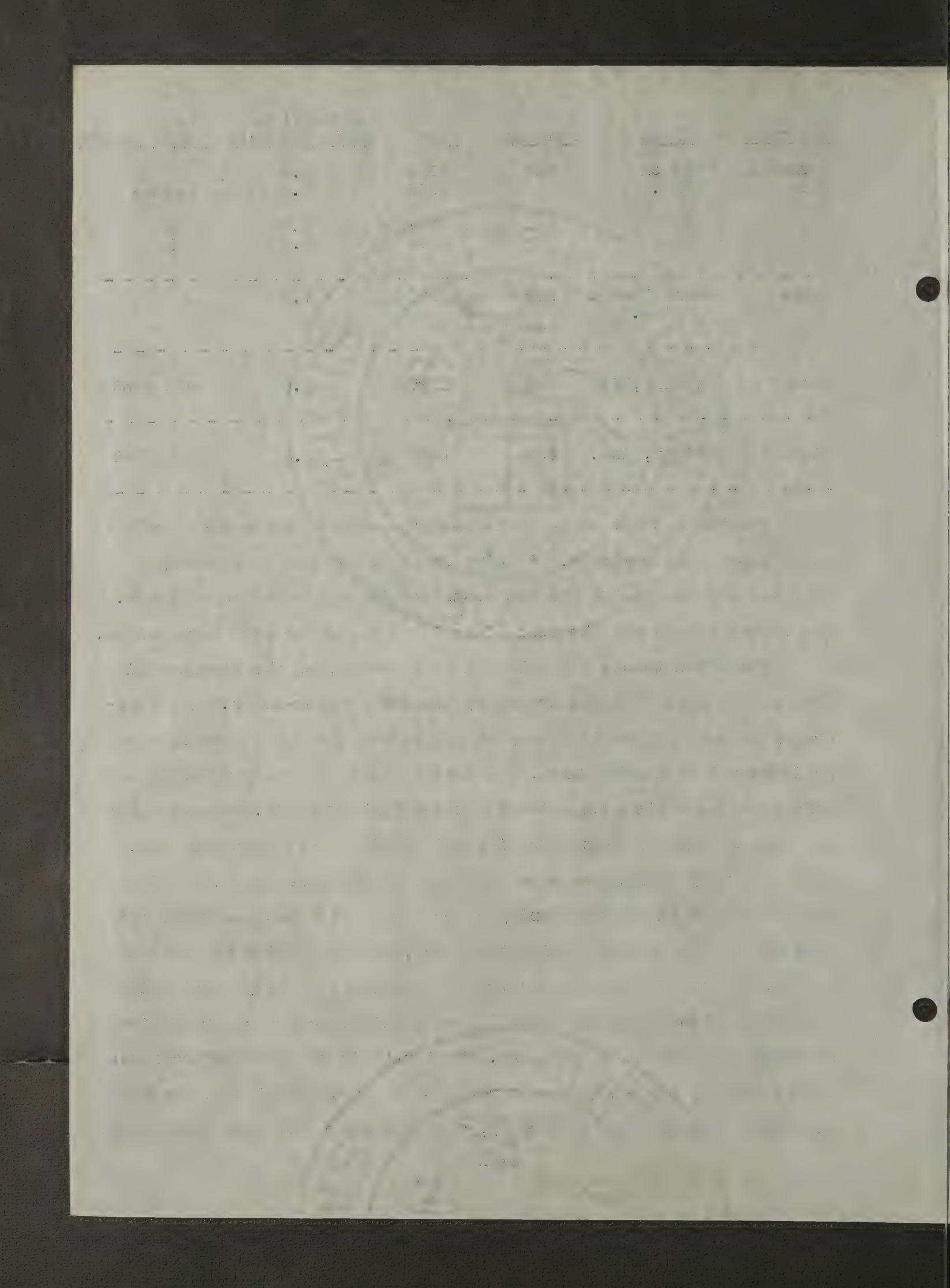
Populations and Kills. Forbes and Cross (1907), in an "ornithological cross section" of birds taken from Danville to Quincy, August to October, 1906, found that on an average there were 13 quail per square mile, or 1 per 50 acres, and that quail constituted 1.4% of all birds seen. It would have added to the significance of these figures if the difference between the bare prairies on the east end of this line and the good quail country on the west end had been recorded. Even without this comparison between types, however, these figures are of a kind greatly needed but rarely contributed by ornithologists. They are probably low, because dogs were not used.

Table D contains the tabulated results of covey counts and kill records gathered from sportsmen and farmers. The figures contributed by Bowman, Olin, Huff, and Karraker are considered of special significance because they show heavier populations and kills than have heretofore been encountered in any state, or published by other observers. The Olin figures lump the two tracts covered spearately by Bowman, and were given me independently without chance of comparison. In a broad way they prove the possibility of populations, on tracts of the 100 acre size class, up to 2 or even 3 quail per acre, and kills of up to 50%, sustained through a period of years. The best comparable tracts so far recorded are as follows:

| Observer | Place | Acreage | Year | Populations Quail per acre | Kill Quail per Acre |
|---|---|---|---|---|---|
| Bowman & Olin | Alton Ill. | 220 | 1924 | 5.0 | closed |
| | | | 1928 | 1.3 | |
| | | 115 | Best Year | 3.0 | 2 |
| | | | 1928 | 3.0 | 1 |
| Bogle | Round Island Miss. | 110 | 1926 | 7.0 | |
| Greene | McNeill, Miss. | 60 | 1927 | 1.0 | not shot |
| Kimball | Midway, Miss. | 450 | 1928 | 0.5 | not shot |

The Bogle tract on Round Island exceeded in population the Illinois lands here reported, but being an island it was practically a pen, and the population was not sustained through a period of years. The island burned off the year after the 7 birds per acre were raised.

The Alton tracts are suburban real estate, on the Mississippi bluffs. The soil is loess broken by limestone "sink-holes." The topography is rough, There is plenty of grass, weed, and brush cover, but no grain except on nearby farms. The interspersion of cover types is very great-possible enough to offset the lack of grain. The only mangement was 6 years of winter feeding and killing 10-12 cats per year. There are many skunks and some hawks but probably no foxes. The high population and kill could hardly represent a drift because there are less quail outside than inside the tract, and the outside is heavily hunted. Nor does it seem likely that it represents to any great extent a winter concentration of birds raised outside, because cover outside is scarce and dwellings frequent. That this is not a "freak" occurence is attested by the six years of repetition and the fact that the Marraker homestead, in another county, attained about the same population.



Covies per Day. A few random figures on covies per day were collected, and are here given for what little they may be worth. This is now regarded as only a rough index of quail populations, but it is an index so easily used that the accummulation of figures may be of value.

| Observer | Year | County | No Dogs | Covies per day Found & Hunted | Acres per Quail(see Table D) |
|---|---|---|---|---|---|
| Bowman | 1924, best day | | ? | 27 | |
| Abernathy | 1928, best day | Lawrence | 1 | 13 | |
| Miller | average | Marion | 1 | 8-10 | |
| Williams | best day | Winnebago | ? | 3 | |
| Rowan | best day | Boone | 1 | 2-3 | |

Revised Estimate of Quail Crop, Quail Income & Taxes. The significance of the Alton tracts is that it allows of doubling the estimated possible farm income per acre from quail, and cutting in two the area necessary for a sportsman or farmer to lease in order to enjoy shooting.

It may be now said with confience that enough birds for two sportsmen may be raised on a single 160 acre fram, with some left over for the farmer or his boy. It may also be said that the farmer with the right kind of land in the right condition may realize a considerable income from his quail crop. If gulf states lands yielding a quail per 5 acres lease for 15¢ per acre per year, then Illinois lands yielding a quail per half acre might lease for enough to actually pay the taxes. The following tax figures were gathered at random:

| County | Farm Land Worth | Is Taxed Per Acre |
|---|---|---|
| Sangamon | $200 | $1.40 |
| | 100 | 1.10 |
| | 50 | .50 |
| Calhoun | 50 | .25 |
| Union | 10-12 | .10-.20 |

Winter Losses and Other Fluctuations The accompanying list gives the winter losses reported by sportsmen and farmers, arranged in chronological order. All of these are from recollection and hence may be a year or two off-the losses given as 1916, 17, or 18, for instance, doubtless all refer to the hard winter of 1917-8 which caused heavy losses as far east as Ohio (see p.12, Ohio report.)

The list substantially corroborates the conclusion already stated in the Ohio Report: that winter losses in the cornbelt will average, for any one locality, ten years or more apart, and are therefore not a heavy enough risk to deter any reasonably determined sportsman or farmer from trying to raise a quail crop.

Map C shows the line below which the risk of winter loss is believed to be negligible. This line is surprisingly far south, for two probable reasons:

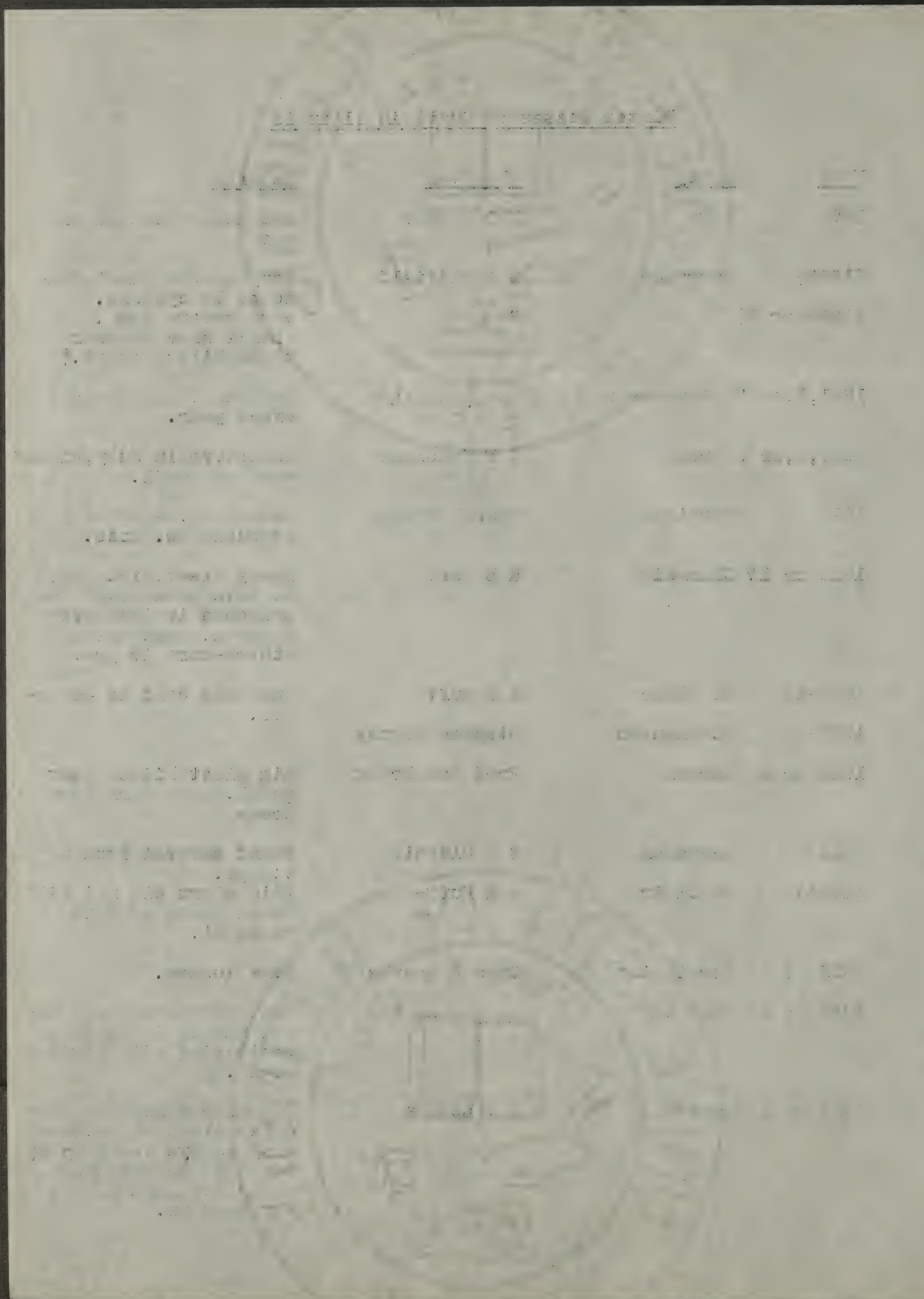
(1) The sleet risk in central Illinois seems to be almost as heavy as the risk of protracted cold and snow in northern Illinois.

Most sleep reports are from central counties.

(2) Weather that will kill southern Illinois quail would hardly be felt in Wisconsin.

## Winter Losses of Quail in Illinois

| Year | County | Observer | Remarks |
|---|---|---|---|
| 1875 | Lake | W C Brewer | Bad loss about 55 yrs ago. |
| (1883) | Sangamon | S A oldfield | Very severe sleet, followed by cyclone. |
| (1888 or 9) | " | " | Very severe snow. (Don't know whether these killed quail.) |
| 1891,2,or 3 | Stephenson | Stephen Rigney | Bad loss. Can't recall exact year. |
| 1907,8,or 9 | Green | C F Mansfeld | Hailstorm in July, Killed most of quail. |
| 1913 | Vermillion | Chas H Sparks | Deep snow, especially in Iroquois Co. Loss. |
| 1916 or 17 | Champaign | H B Ward | Heavy sleet. Birds said to have been found imprisoned in iced-over coverts. Remembers no others-here 19 yrs. |
| 1917-18 | St Clair | N R Huff | Snow and cold in December. |
| 1917-8 | Stephenson | Stephen Rigney | |
| 1923 or 4 | Morgan | Fred Lashbrook | Big sleet killed many quail. Limbs torn from trees. |
| 1924 | Sangamon | S A Oldfeld | Found several frozen coveys. |
| (1924) | St Clair | N R Huff- | This storm did not kill quail south of 39th parallel. |
| 1925 ? | Vermillion | Chas H Sparks | Some losses. |
| 1925 or 6 | Hancock | _____ Sparks | Next year only half usual number in spite of restocking with Mexican quail. |
| 1925 or 6 | Madison | H J Bowman | Tremendous loss in December sleet storm. Found many coveys caged up by ice & 10 coveys dead after ice melted. Crop shy next yr. |



## Winter Losses of Quail in Illinois (con't)

| Year | County | Observer | Remarks |
|---|---|---|---|
| 1926-7 | Hancock | L C Dadant | Bad losses for some unknown reason. |
| (1927-8) | " | " | No loss. Crop good, 1928 |
| 1927-8 | Madison | John M Olin | Sleet in December imprisoned some quail. |
| 1928 | Henderson | Frederic Leopold | Probably heavy losses. Bad weather 6 weeks. |
| 1928-9 | Rock Island | Gus Radebaugh | |
| 1928-9 | Hancock | L C Dadant | No loss where winter feeding practiced. |
| 1928-9 | Stephenson | Stephen Rigney | Loss in border counties. Less snow further south. |
| 1928-9 | Lake | W C Brewer | Bad loss. Nearly cleaned out. |

The second reason is not susceptible of proof, but I am personally convinced it is a fact. If it is, it further emphasizes the fundamental importance of not tampering with indigenous strains by importation of Mexican or other more southerly stock.

No study was made of yearly fluctuations due to weather or other accidents. It is my impression that the types of population curve of northern and southern quail laid down in the Mississippi report hold good for northern and southern Illinois respectively.

1928 Loss Grit Consumption It is as yet too early to appraise the degree of loss sustained during the hard winter of 1928-9.There is general agreement that there was more winter-feeding than usual,and that the loss was not as heavy as the depth and duration of snow would lead one to anticipate. Lodge counted 65 quail and 119 pheasants at his feeding station in Pratt County last fall, of which 41 quail and 39 pheasants were still there in the spring, a survival of 61% and 33% respectively,assuming no shifts.Since he feeds a sack of grit to a sack of grain (it is consumed in almost this ratio)and since surrounding coverts are scarce,there may have been no shifts in this instance. Shifts of location toward the end of the winter were very noticeable in southern Wisconsin,and seemed to be associated with gritless feeding stations.

Conifers for Winter Cover Norway spruce has heretofore been advocated as the quickest-growing coniferous cover for winter feedings stations in the cornbelt.Bowman challenges this for the Alton region,and says that White pine,Scotch, and Austrian pine will all outgrow (and outlive)it in that locality. He has obtained 3 ft of height growth in young white pine while an adjacent Norway spruce grew 10 in.This presents a concrete and easy

research problem which foresters should help to answer: what conifer makes the quickest, cheapest, and most acceptable quail cover in each of the Illinois soil types?

Bowman says quail like Red Cedar, but that it is too slow and lacks spread. In Wisconsin quail show no special liking for cedar (but rabbits do, especially the procumbent species, J. Communis).

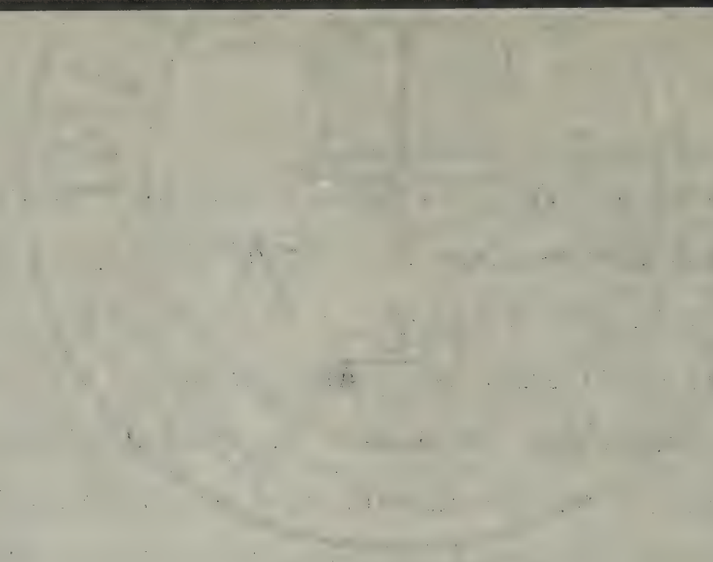
The prevalence of locust thickets in Illinois affords especially favorable sites for coniferous cover plantings. Growth of conifers under or near locusts is often doubled by reason of nitrogen-fixation by the locust roots. It has the same ability to enrich the soil as alfalfa, and in addition the beans are an important winter quail food.

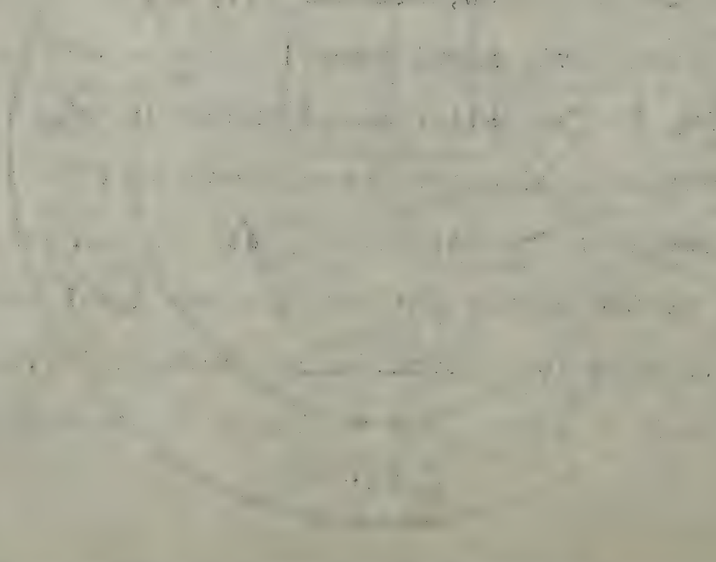
Mexican stock Importations of Mexican Bob-white have not ceased, but in 1925 had reached the rate of over 10,000 per year. Map E, compiled by the Conservation Department, shows the numbers distributed by counties for the three years 1925, 6, and 7. Only the totals for 1926 and 7 were of record, so the distribution was assumed proportional to 1925.

Nothing better illustrates the fundamental fallacy in the popular attitude toward game conservation than the repeated expenditure of large sums for Mexican quail.

Such importations show, first of all, a lack of realization of the fact that if the environment were in good condition there would be no need for adding to the native stock, except on those areas entirely shot out. Complete extermination rarely occurs even in small spots.

Such importations further show a lack of appreciation of the extreme intricacy of the adjustment between any local race of birds and its environment. The Mexican stock, in all probability, differs from the native stock enough to constitute a risk of disturbing that adjustment,





Map E

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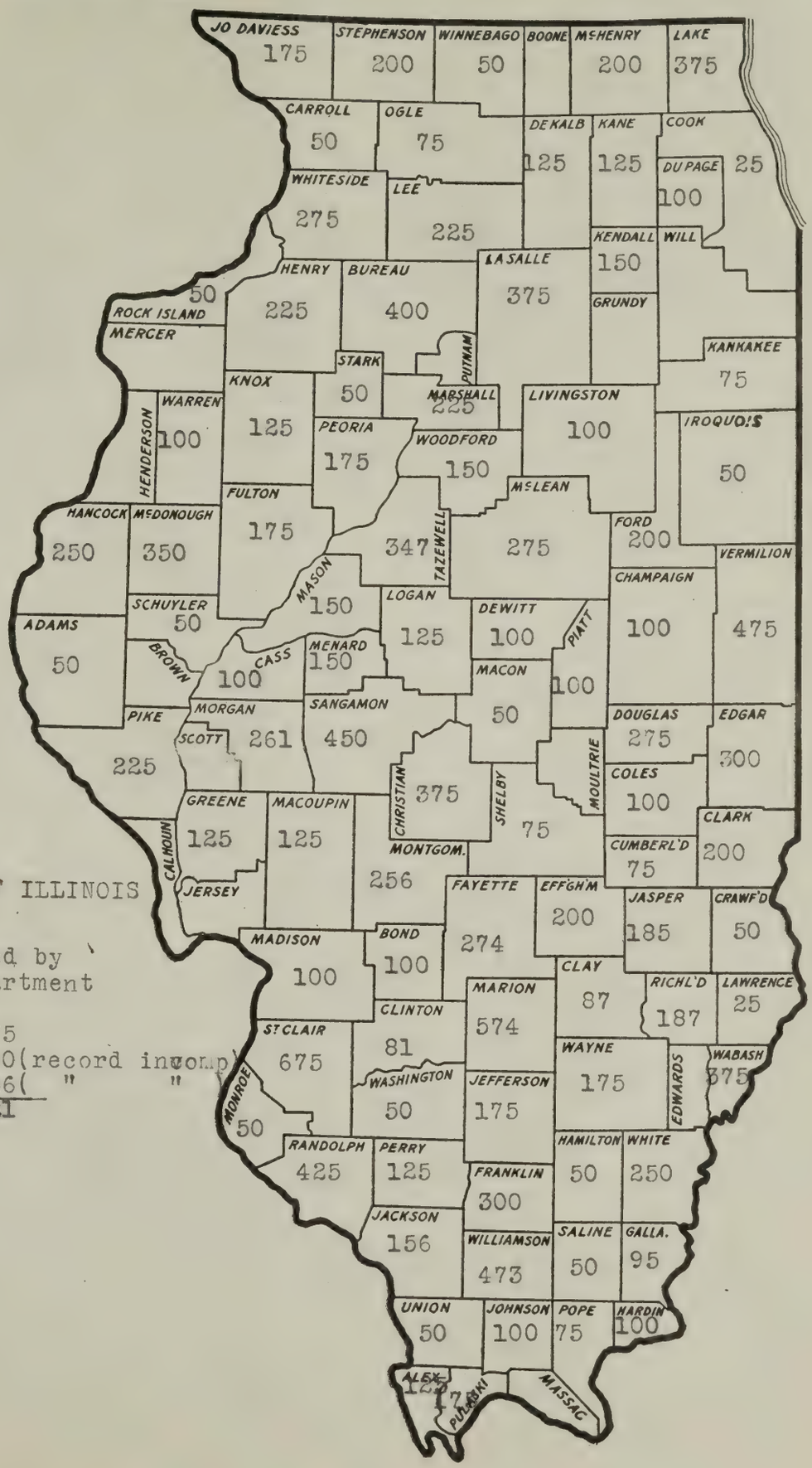
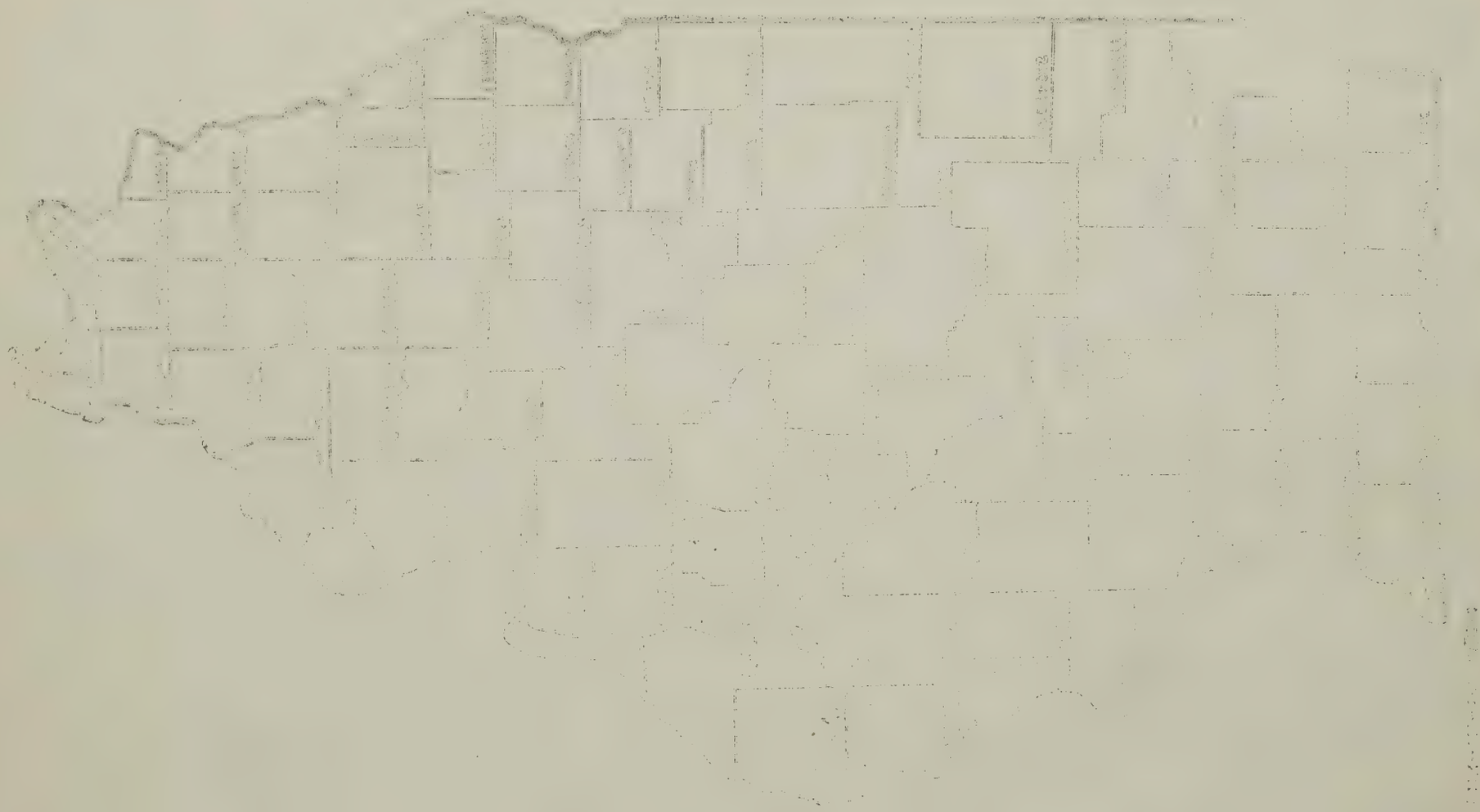



GAME SURVEY OF ILLINOIS

Quail Distributed by
Conservation Department

1925-- 10,975
1926-- 5,000(record incomp)
1927-- 546( " " )
16,521



but not enough to hold out any probability of succeeding in an environment in which the native stock had already failed.

It is the popular impression that the Mexican birds did not usually survive, and in many instances it is the impression that they did not stay where liberated. Most sportsmen claim that they can tell the two races apart, but this may be considered as open to doubt. There are, of course, all kinds of reports about the peculiarities of the Mexican strain which are necessarily premised on the ability to identify them in the field. The most frequent, which is probably correct, is that they run a great deal more than the native birds. Another is that they roost in bushes (presumably meaning all year). This may be regarded with some doubt.

The most important point to be recorded is the attempted dilution of native blood in practically every county in the state. Of course it is just as difficult to proce that this had or will do harm, as it was that it would do good. The probabilities are that the Mexican strain lacks the ability to survive in Illinois to an even greater extent than Stoddard found to be the case in Georgia, in which even t no permanent damage may have occurred.

Miscellaneous Life History Data I gathered the impression that there was a tendency in Illinois for quail to gather in abnormally large covies. Such covies probably represent a concentration on some favorite food supply and hence is information of practical importance to management.

Baker says he saw one covery in an osage orange hedge near Peoria containing 150 birds. Bowmn reports one covey of 81 birds actually counted on the Alton tracts. Stoddard has observed large covies in the woods in winter in Georgia, representing a concentration on acorn food.

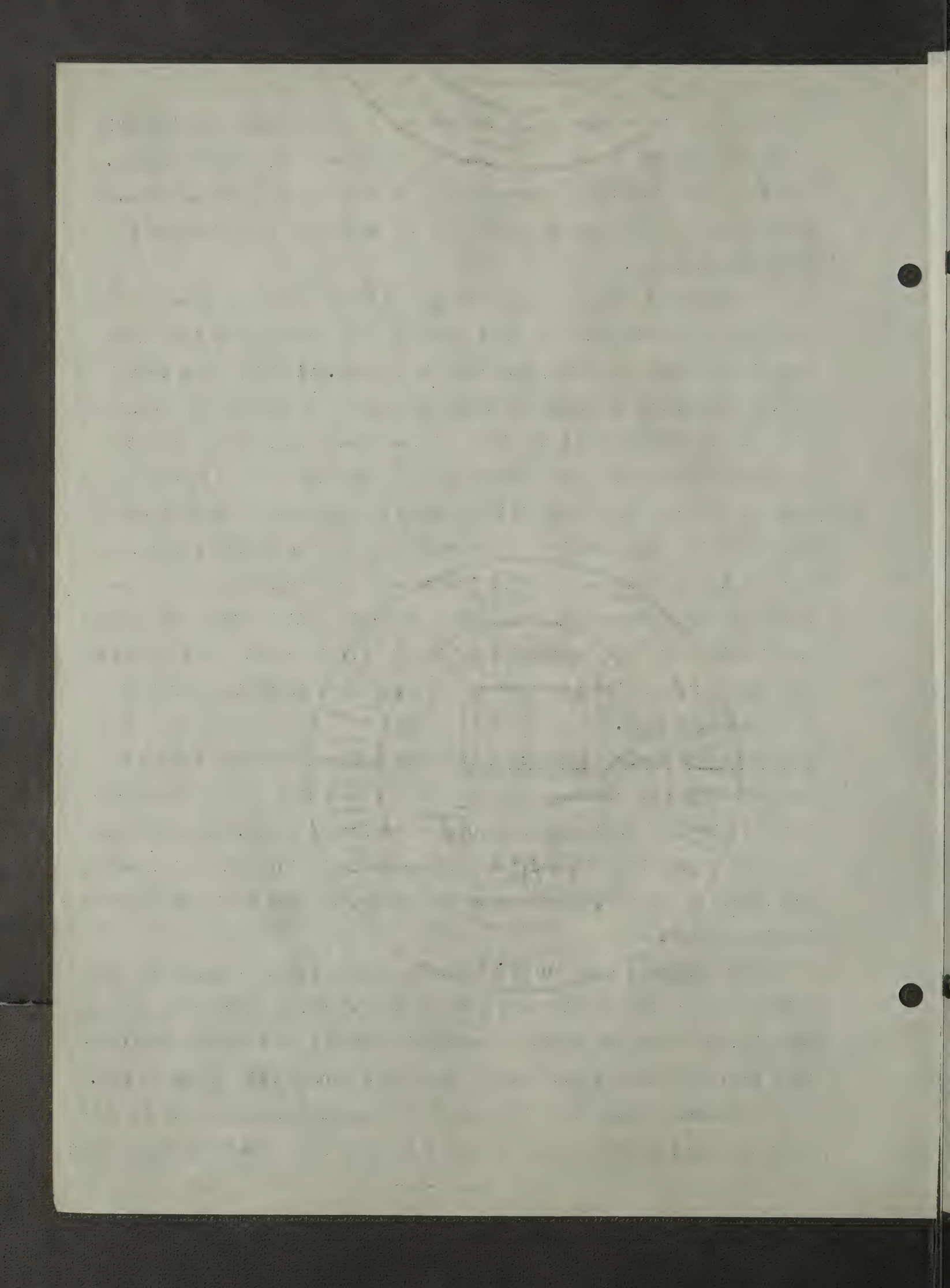
A few observations were also made on the phenology of quail in

Illinois. Covies were still intact on the Alton trace and the male birds had not yet begun to whistle at the time of my visit April 2. Whistling had sta ted in Lawrence at the time of my visit April 4. Evidently April 1 is about the date for the beginning of whistling in southern Illinois.

The travel period or periods in which covies shift location and seek winter quarters is the last two weeks in October and the first week in November at Alton, according to Bowman. Evidently this travel period represents a southward trend as well as a shifting of population, for the reason that the bend of the Mississippi River at Alton frequently results in birds trying to fly from the apex of the bend southward across the river into Missouri. Bowman has observed these flights while duck hunting on the sand bars of the Missouri side, and once he saw a whole covey of 15 birds drop from exhaustion into the water. This was after they had made a half-mile flight from the Alton vluff with an initial elevation of 200 feet. This constitutes evidence that the maximum distance a quail can negotiate in a single flight is around 1/2 mile.

Miscellaneous Management Data Bowman has kept an accurate record of the percentage of cripples lost in his own shooting in the Alton region, and gives 3% as his average over a period of years. This loss must be added to the kill in order to determine the actual removal from any area. Hence it is of importance to management to have a figure representing its magnitude.

The Illinois data point toward the conlusion that quail can sustain a higher kill in Illinois than in the south. Stoddard considers a 35% kill as about the limit of safety in Georgia, whereas the quail record from the Alton tracts show a sustained annual kill of up to 30%. It is doubted whether the difference in Illinois and the south is actually as great as these figures would indicate, but I have no doubt that



a difference exists and that it is in favor of the Illinois territory. The reason may lie in the greater mortality from predators in the south during the winter period and especially during the nesting period.

Summary of the Quail Problem in Illinois This report does not attempt to repeat the general approach to the quail problem already developed in the reports for Ohio and Iowa. For the benefit of those who have not seen those reports it may, however, be briefly summarized as follows:

The root of the qual problem is to restore the land to a condition suitable for quail.The most important item is the restoration of clover.

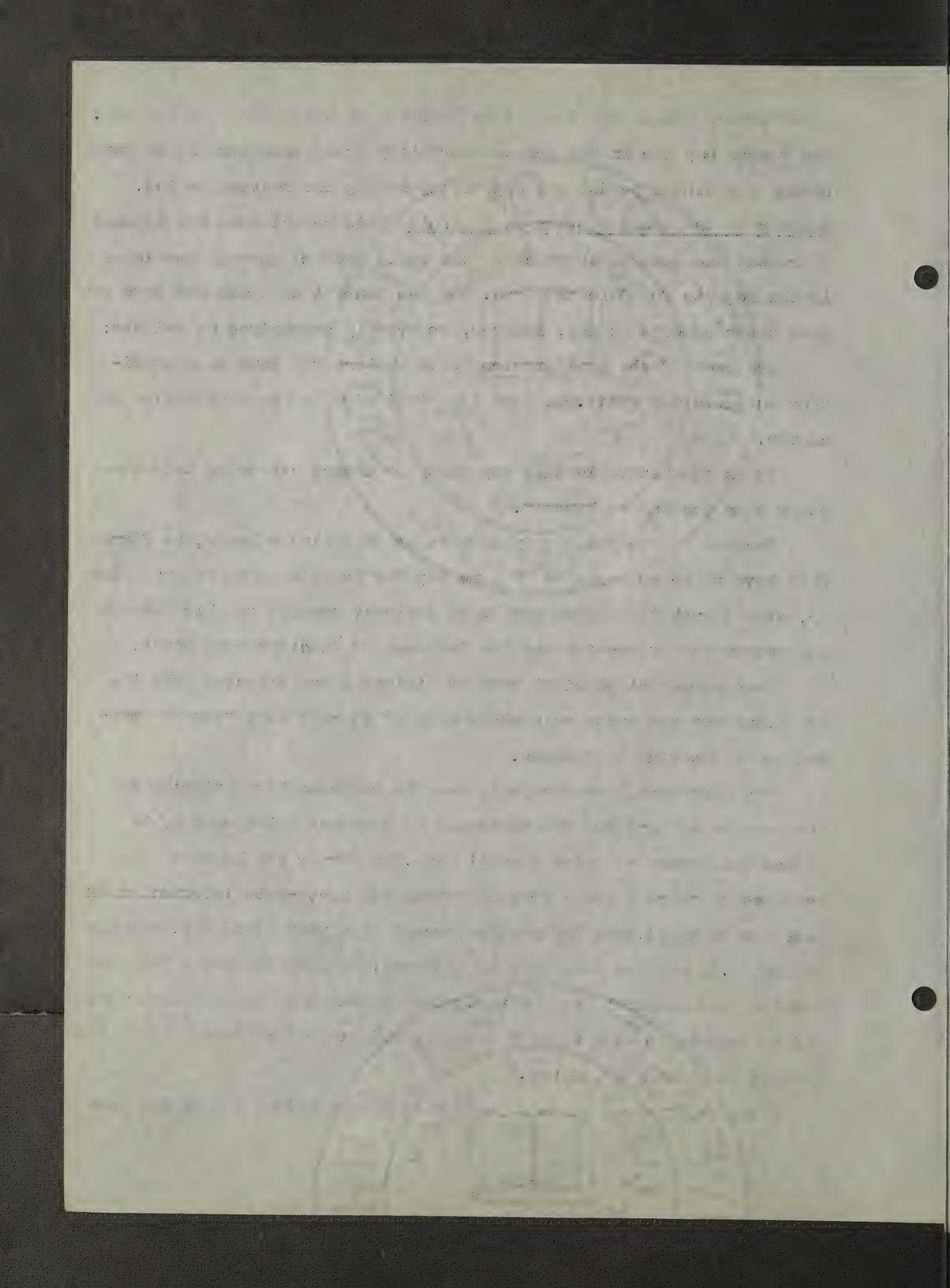
It is inconceivable that any party or agency can bring this about other than the farmer himself.

Because of the relatively high value of Illinois lands,the farmer will have to be compensated in some way for devoting land to quail cover, even though that cover may be of indirect benefit to him through the prevention of erosion and the increase of insectivorous birds.

This compensation might come on limited areas directly from the state,but for the state as a whole most of it must come from the marketing of shooting privileges.

The sportsman,therefore,will have to overcome his antipathy for the posting of land and the marketing of shooting privileges,if he wishes the farmer to raise a quail crop.The farmer can be further encouraged to raise a quail crop by giving him up-to-date information on just how to do it.This information,except in a very broad way,does not yet exist.It must be developed by research.The logical agency for performing that research pertaining to farm problems is already under way and in connection with which a large organization for disseminating the results is already organized.

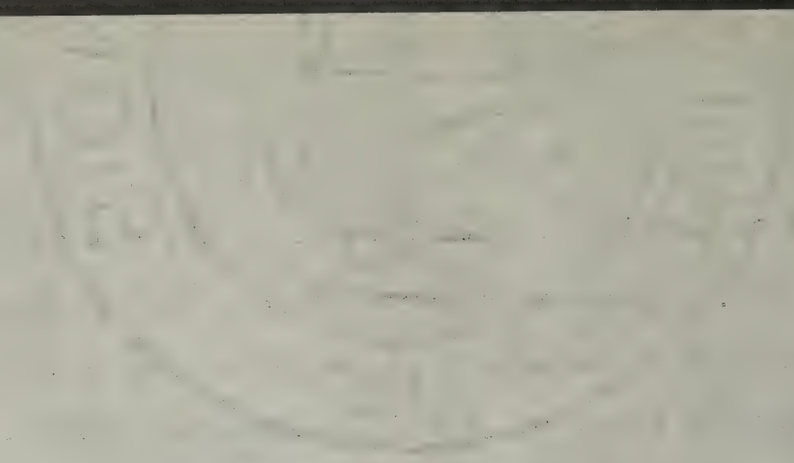
State refuges and state forests will not benefit quail to the same



extemt as other species of game because of the extremely local character of the bird. In order to serve as reservoirs of quail stock such refuges would have to be very close together and hence would have to be too numerous to admit of practicable administration.

In conclusion, the outstanding need of the quail situation is to encourage the farmer to raise quail by allowing him to realize on their commercial value, and by providing him with the necessary facts.

The development of quail preserves and of the deliberate cropping of quail by farmers is covered under a subsequent section on land and shooting privileges. The relation of quail to pheasants is covered under pheasants. The proposed research work is covered under research.



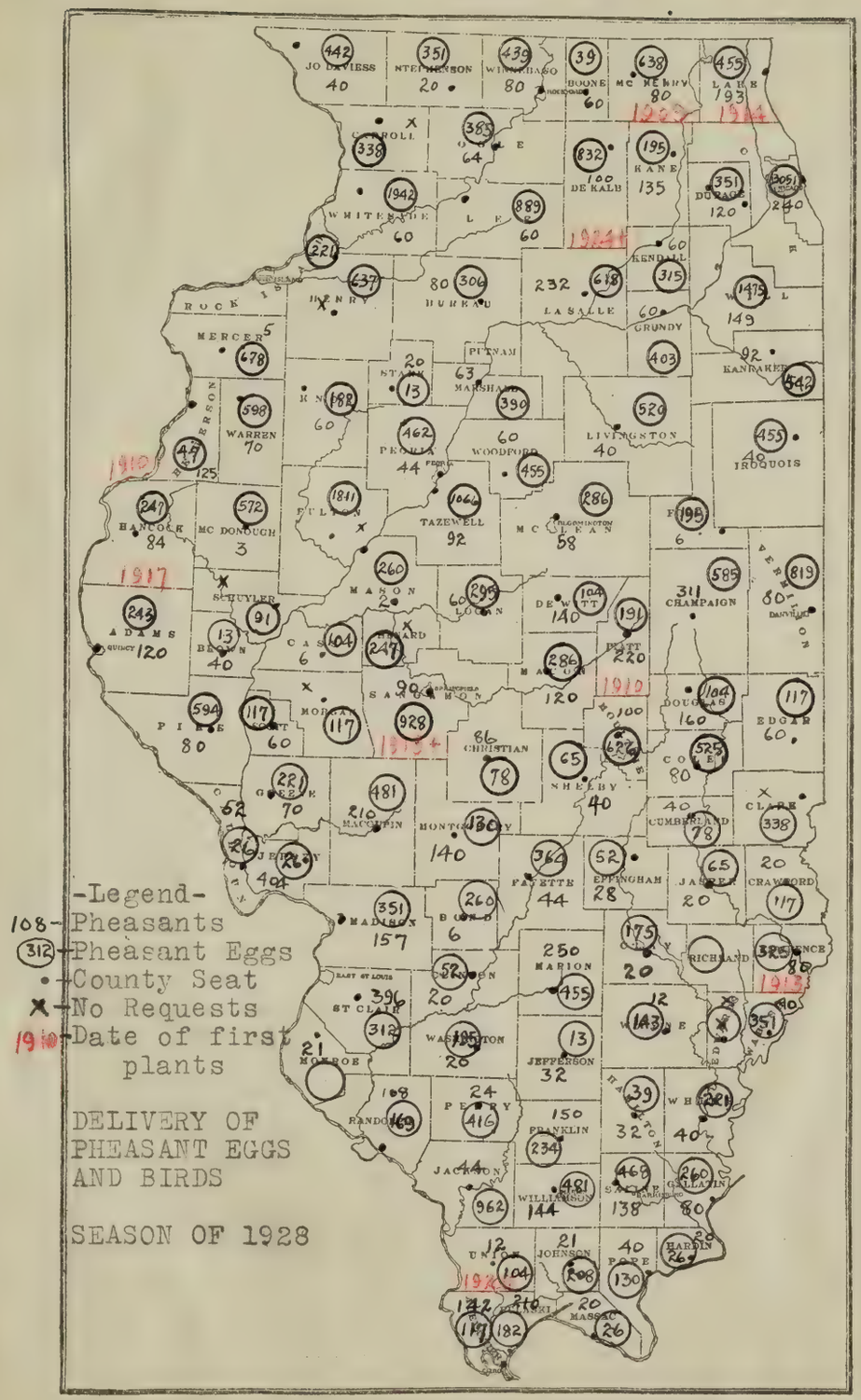
9 Ringneck Pheasant

History of Plants Map F shows the pheasant stock and eggs distributed in 1928 as reported by the Conservation Department.It also shows in red approximate dates of the first plantings of pheasants as determined from the recollections of sportsmen.No attempt was made to get exact dates because it is evident that the whole state has been stocked with sufficient persisitence and for a sufficient time to show what regions are adapted to produce pheasants in a wild state.Some plantings must have been made earlier than the dates shown in red,especially around the Evans Game Farm in Kane County.

An open season of 5 days,with a bag limit of 2 cocks was established by 1915 and has continued in effect since that time.

Results of Plants. Map G shows in as much detail as could be obtained in a short survey the present distribution of pheasants and Hungarians and their relation to glacial soils.It also shows plants which failed and plants made too recently to afford conclusive results.It is evident,of course,that this record includes only a very small proportion of the total plants made.No plants were recorded except where there was sufficient evidence of either establishment or failure,or where unconclusive plants have been made in a locality where the results should be watched with special interest.The question of what this shows as to what constitutes pheasant range is discussed in a subsequent caption. It will suffice here to say that the species is definitely established and thriving in that part of the Lake region hatchured in red. There is some evidence of further spread being in process,especially southward.In the rest of the state there is nowhere a sufficient number of conclusive establishments to clearly warrant classification as established range.The nearest approach to this are the bottoms of the Illinois River from La Salle County to Scott County,

Map F Pheasant Propagation



Map G

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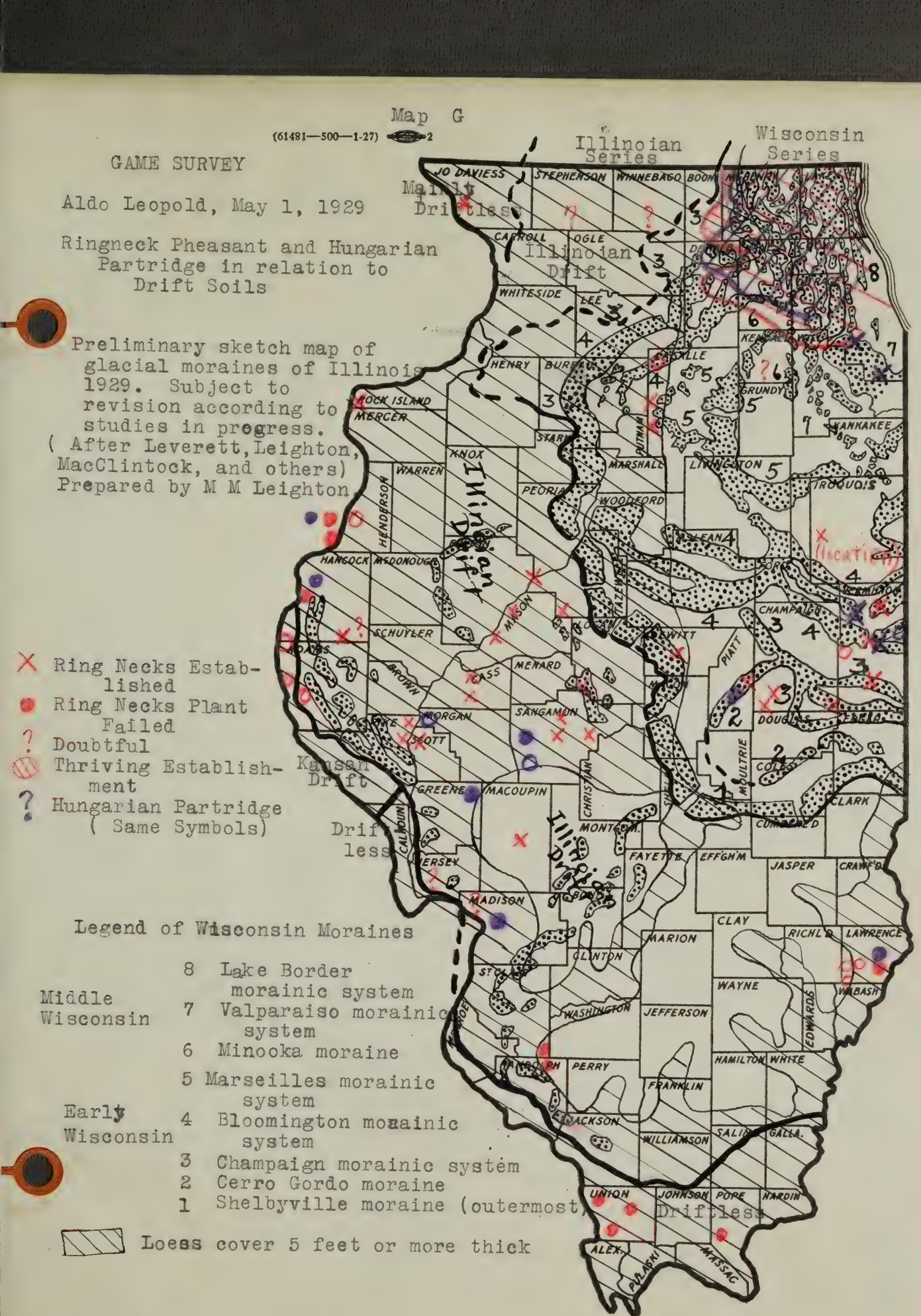
GAME SURVEY

Aldo Leopold, May 1, 1929

Ringneck Pheasant and Hungarian Partridge in relation to Drift Soils

Preliminary sketch map of glacial moraines of Illinois 1929. Subject to revision according to studies in progress. ( After Leverett, Leighton, MacClintock, and others) Prepared by M M Leighton




X Ring Necks Established

● Ring Necks Plant Failed

? Doubtful

Ⓣ Thriving Establishment

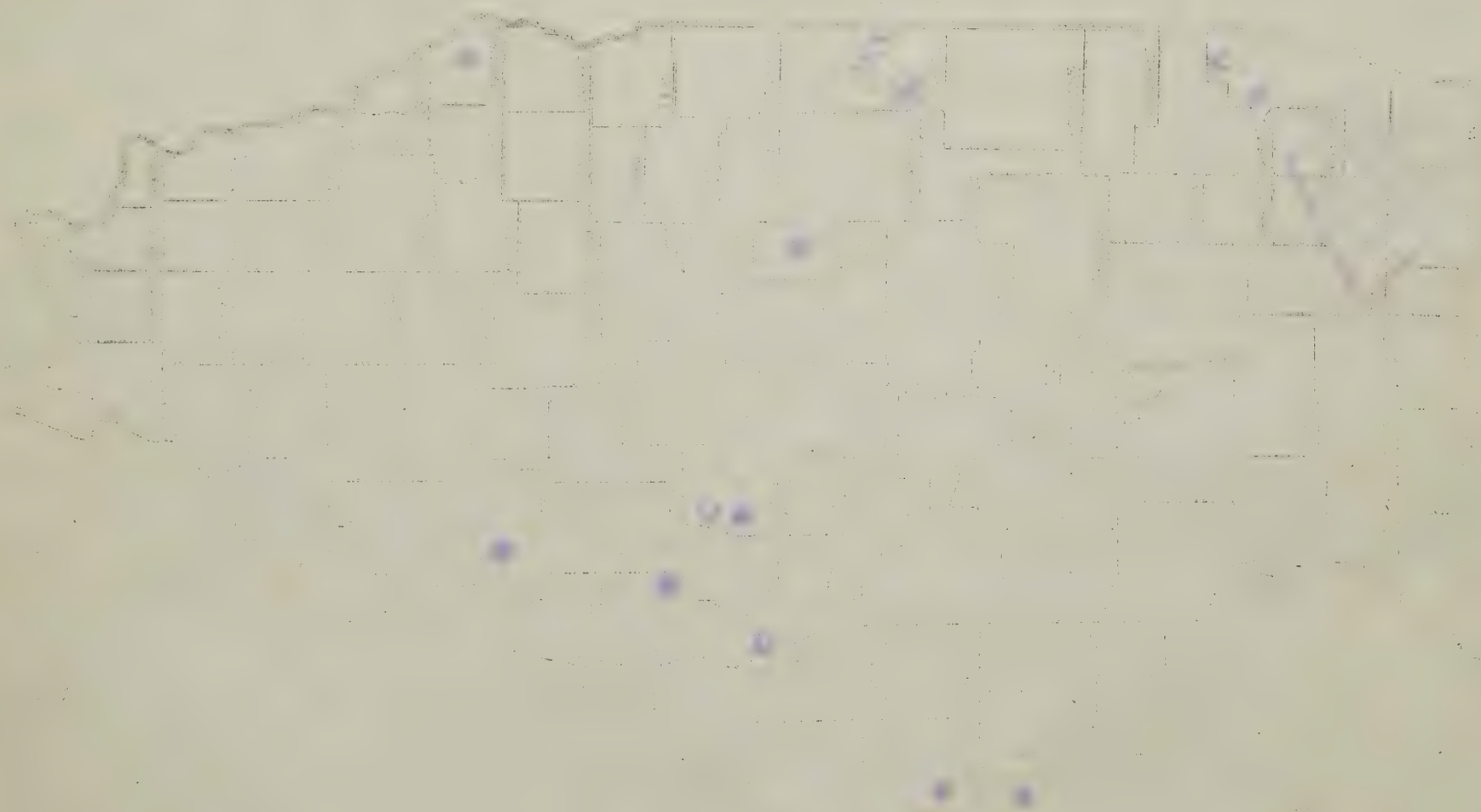
? Hungarian Partridge ( Same Symbols)

Legend of Wisconsin Moraines

| | | |
|---|---|---|
| Middle Wisconsin | 8 | Lake Border morainic system |
| | 7 | Valparaiso morainic system |
| | 6 | Minooka moraine |
| | 5 | Marseilles morainic system |
| Early Wisconsin | 4 | Bloomington morainic system |
| | 3 | Champaign morainic system |
| | 2 | Cerro Gordo moraine |
| | 1 | Shelbyville moraine (outermost) |

▨ Loess cover 5 feet or more thick

( Base prepared by M M Leighton, State Geologist: Not to be published without resubmission).



This stretch of the Illinois River apparently corresponds to the ribbon-life extension of pheasant range along the Scioto River in Ohio.

The next nearest approach to conclusive establishment is found in the creek bottoms of Sangamon,Macoupin,and Green.The establishments in Hancock,McDonough, and Jo Daviess counties are based on the reports of only 1 to 3 persons in each case and should be only tentatively accepted.The establishments in Champaign and Vermillion counties show little agression and thin populations, probably due to lack of cover.There are probably good establishmemts in the Kankakee region on which no data was obtained. The question marks in Stephenson and Winnebago counties indicate a condition similar to Champaign county,only still weaker.

The pheasant is one of the most difficult of all birds to cover by census.This is because they do not form covies,have a relatively wide cruising radius,and are often impossible to flush when they have taken refuge in swamp grass. Only one census was obtained: a farmer in Sangamon County kept careful watch on his birds and determined that he had 23 on 160 (?) acres,or 1 per 7 acres.This is probably an optimum figure for Sangamon County.

An index to abundance which is less satisfactory,but more easily obtained,is pheasants flushed per day in hunting.The following figures were obtained and have been arranged to represent progression from northeast to southwest.They probably represent optimum rather than average finds.

Pheasants Flushed Per Day

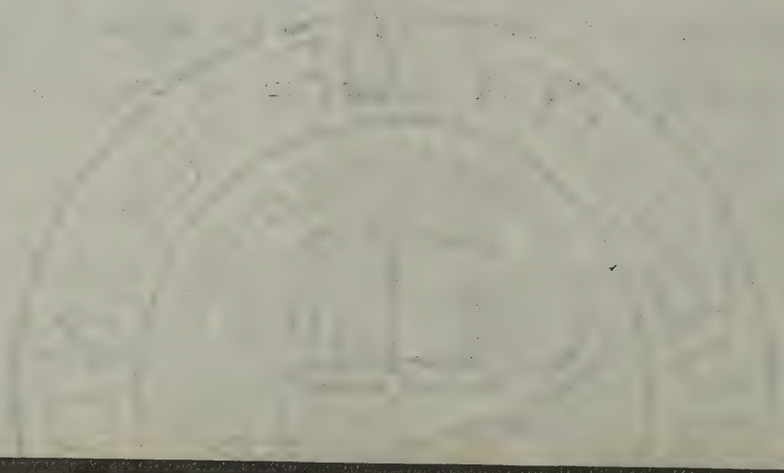
| Observer* | County | Place | Date | Per Man Per Day with Dog |
|---|---|---|---|---|
| Brewer | Lake | ? | ? | 25 |
| Nadelhoffer | Lake | Gurney | ? | 40 |
| Rowan | McHenry | Big Slough | ? | 25 |
| Wilson | McHenry | Marengo | ? | 25 |
| Wakeley | McHenry | Harvard | ? | 12-15 |
| Musselman | Scott | Naples | 1925 | 40 |
| Sparks | Hancock | Augusta | 1925 | 7-8 |
| Lashbrook | Morgan | Meredosia | ? | 12 |
| Radebaugh | Champaign | | ? | 6-7 |

Planting Policy As in other states, distribution of state stock has taken the form of eggs and 10-week birds. No official figures on results from egg distribution have been published but Radebaugh gave the following figures in a public address:

Eggs hatched . . . . . 49%
Birds lost by Death . . . 22%
" " " Predators.. 6%
Total Loss Before Liberation 28%
Birds liberated 21%

The prevailing sentiment seems to regard this net success of 21% as too low, and there is a proposal to abandon the policy of furnishing eggs to farmers and sportsmen on this account. It would appear, however, that 21% is not a wholly unsatisfactory figure in comparison with similar work in other states.

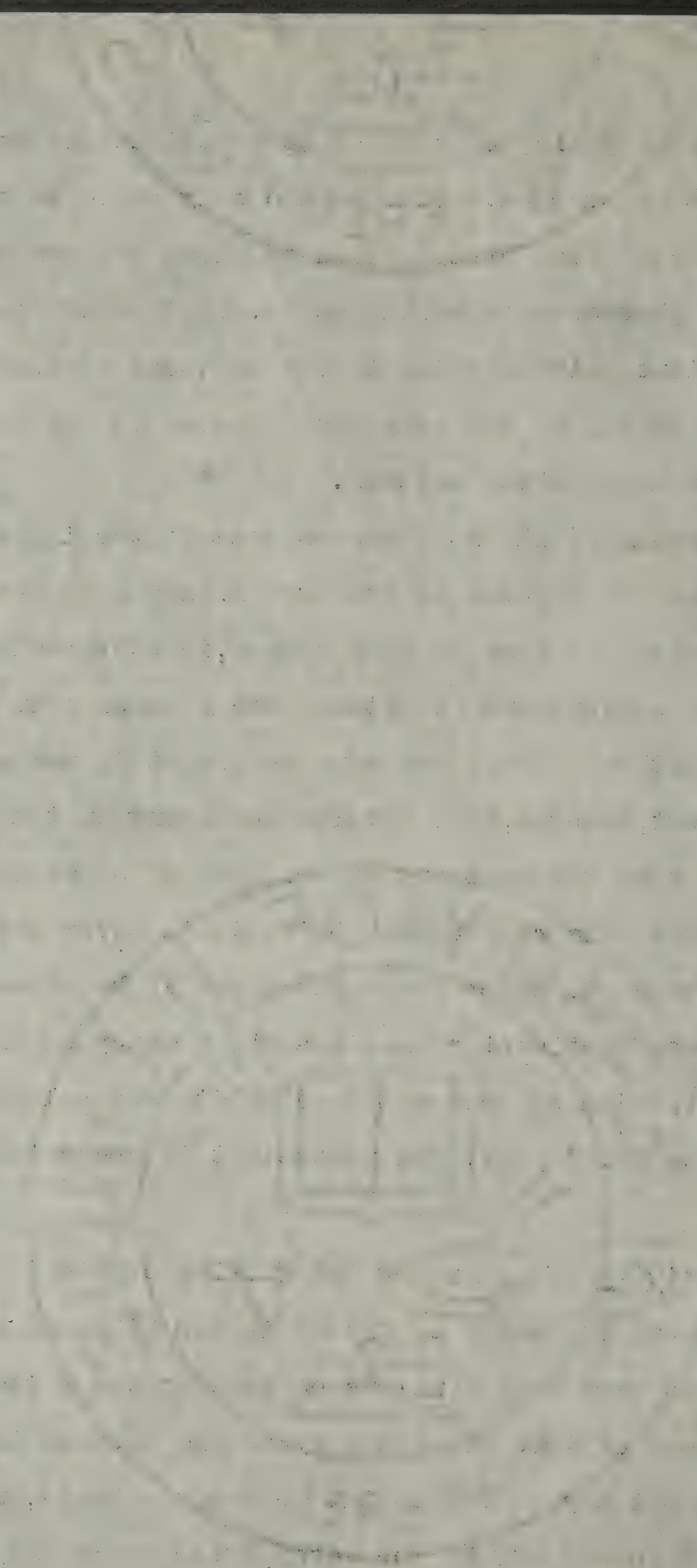
Map F shows that both birds and eggs are still distributed statewide without any regard for the success or failure of past plantings.



Ohio follows the same policy of state-wide distribution regardless of historic evidences of success. Iowa is the only state so far encountered which has discontinued distribution to those regions obviously unsuited to support pheasants in a wild state.Map E would indicate that it is futile to continue distribution in the southern counties and at least of doubtful advisibility to continue distribution in the loess prairie type except on the large river bottoms.

Farm Sentiment Throughout Illinois one encounters the impression that the majority of farmers are opposed to the establishment of pheasants.In some cases the reason given is fear of crop damage,in others alleged interference with quail.No allegations of actual damage which seem substantial were encountered,although there was some complaint in northeast DeKalb County.It is evident,however,that adverse sentiment on the part of farmers is more important than the doubling or tripling of stocking operations,because outside of the Lake region and the Illinois River bottoms it would be easy for any farmer to exterminate the birds if he wished to.The existence of this adverse sentiment emphasizes the urgency of an impartial and scientific investigation of pheasant food habits and relation to native species.The results would carry the mostweight if conducted by an agricultural college.

Factors of Productivity The only new information obtained on factors affecting pheasants was on damage by floods in the Illinois bottoms.Phelps says that pheasants were very numerous on some of the bottoms below Beardstown until the flood of 1926 broke the dykes and drowned them out. He says that the birds do not try to fly to the adjacent uplands,but simply sit on a high place until forced off by the water,after which they hop into a tree where they either starve or are chased out by hawks.A similar report offlood

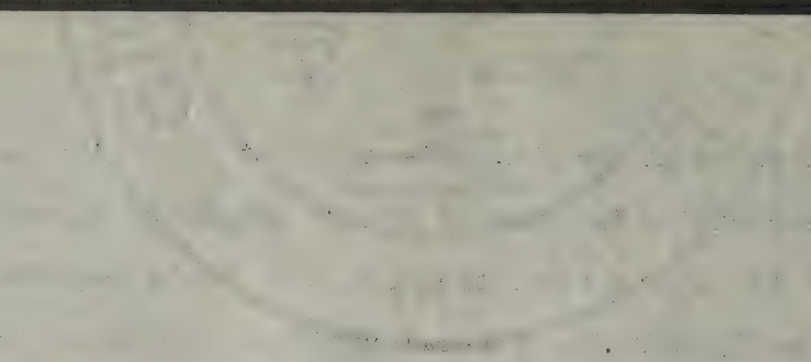


losses was obtained at Peoria. This apparent inability to cope with floods is somewhat surprising because of the frequency of floods in the Chinese range of the species and the fact that Beebe reports that the birds occasionally swim.Its general aptitude for water is well known.

It should be emphasized here that the relative importance of various factors of productivity has never been quantitatively determined either in Illinois or elsewhere,and until this is done we can only guess at the answer to management questions.

In the lake region swamps are obviously the mainstay of this species.In the other parts of the state it is found principally in or near river bottoms or upland sloughs or near the banks of drainage ditches. in each case the indication is that cover constitutes the limiting factor and on suitable soils determines the distribution and abundance of pheasants.It has already been stated that the New Drift Prairie type would probably make excellent pheasant ground but for the almost complete absence of cover.It remains a puzzle that this type should be notably unproductive while the glaciated prairie of Iowa with the same large cornfields with standing corn in winter and with an apparently similar lack of grassy sloughs or draws should support an abundance of these birds.

What Constitutes Pheasant Range:Relation to Drift Soils The complex intermixture of drift and non-drift soils in all of the Illinois types except the Lake region has already been discussed in Part I.The results of plantings to date have also been discussed.It remains to interpret those results in their bearing on the hypothesis first advanced in the Iowa report that the successful establishment of ringneck pheasant in a wild state is limited to glacial drift soils, and the corollary of that hypothesis developed in the Ohio report is that the species may extend beyond the glacial drift soils on river bottoms where drift material has been



transported by streams.

The final verification of this hypothesis must rest upon much more careful and detailed work than is possible in this preliminary survey. The Illinois work, however, seems to substantiate the following conclusions:

(1) Pheasant plants have uniformly failed in the driftless area of extreme southern Illinois (see Map G).

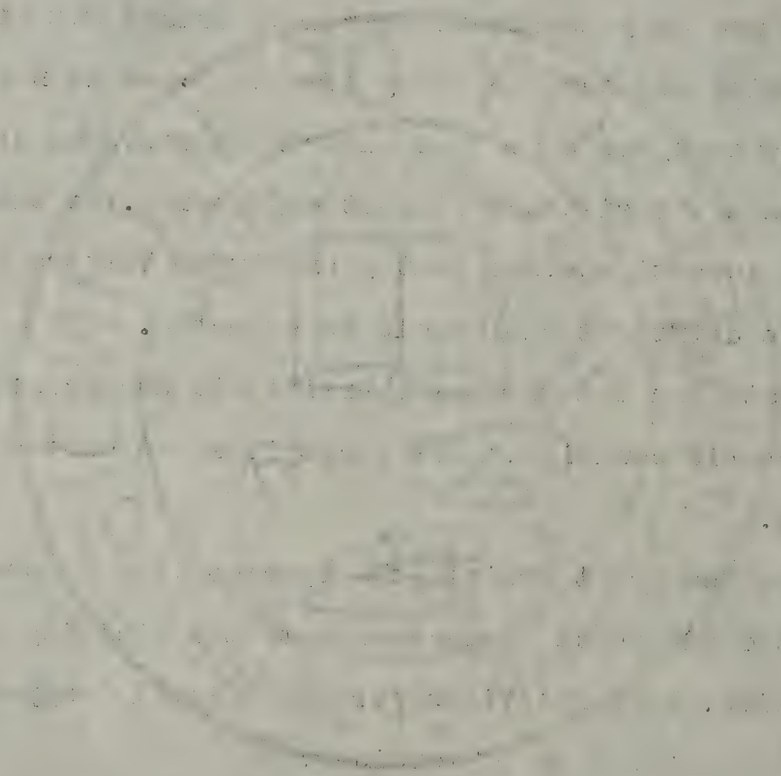
(2) They have failed throughout the Mississippi bottoms and the lower Illinois bottoms except possibly at Lima Lake in Adams County, Crystal Lake in Henderson County, near Galena in Jo Daviess County and at Rock Island. There are many pheasants near Rock Island but it is understood that the stocking has been so heavy that the case is not conclusive.

(3) The loess types show some clear failures, some clear successes, ajd some cases of persistence without aggression. The successes, so far as I was able to investigate, are mostly on stream bottoms or near projecting moraines where drift material would be expected.

(4) The data for the Old Drift Prairie is unconclusive save for Sangamon and Macoupin counties, where there is an undoubted establishment along streams.

(5) On the New Drift Prairie the species is a success wherever cover permits, and the adherence of successes to the vicinity of moraines is very suggestive. These locations were all finally mapped before being compared with the location of moraines.

(6) The Lake region, which is the only drift type with strong glacial expression, is clearly a success. According to this evidence it would appear that the glacial rule holds in Illinois but should be subjected to further and much more careful tests before final acceptance is justified.



Interpretation of the Glaciation Rule M. M. Leighton, State Geologist, suggests that the abe of a soil deposit affects the amount of lime it contains, and that this might readily determine the presence of plants necessary to the welfare of pheasants. The most recent glacial soils are highest in lime because the limestone pebbles have not had time to dissolve. P S Lovejoy of Michigan previously suggested this same interpretation.

Leighton says the Wisconsin drift in Illinois still is a young soil still containing lime pebbles. He points out that the Maumee Lake soils in northwestern Ohio, the Waukesha County soils of southeastern Wisconsin, and the Spirit Lake soils of north Iowa, on all of which Hungarians thrive, are all younger than the soils of central Ohio on which they do not. This might be taken to support my original hypothesis to the effect that pheasants and Hungarians are limited by the same thing, only the Hungarians are even more exacring than the pheasants in the limitation they will tolerate.

Of course the lime hypothesis as an interpretation of the glaciation hypothesis can hardly be said to hold water until it is determined through what plants, or in what other ways, the lime affects the birds.

Evans Game Farm The Evans Game Farm at St Charles was visited by since it was laying season and inadvisable to disturb the pens no special study of methods or equipment was attempted.

The output was 15,000 birds in 1928, the price averaging $3.00 per bird.

The egg output is of course very great. Missouri alone bought 10,000 eggs in 1927 (plus 1,500 birds in 1928.)

The cocks are used for breeding only one year. Some hens are used

the second year for early eggs.

No quail and few Hungarians are raised. The latter lay only when given pens so large as to represent practically natural conditions.

Mr Evans is of the opinion that there are no geographic limits to success with wild pheasants, provided sufficient vermin-control and cover are provided.

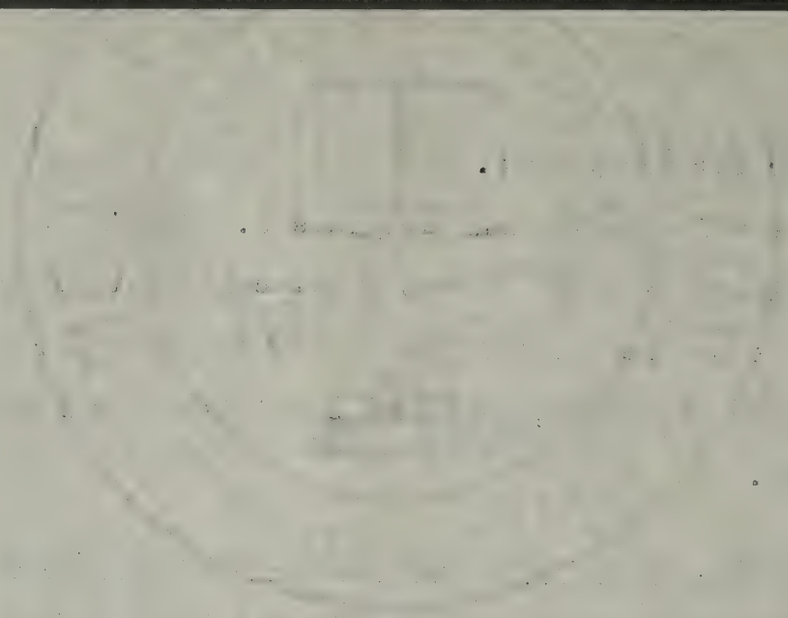
Quails & Pheasants. Is the Pheasant "Adapted to Civilization?" The fact that the greatest abundance of pheasants and the greatest scarcity of quail both occur in the Lake region might lead to the cordusion that the pheasants interfere with the quail. This conclusion would be supported by the fact that in south-central Wisconsin, in not dissimilar country, there are fewer pheasants (only recently stocked) and more quail.

The conclusion is contradicted, however, by the fact that in southeast Michigan, in not dissimilar country, there are plenty of both, and by the fact that the scarcity of quail seems to out-date the introduction of pheasants, Nelson reporting them as only "common" as far back as 1877.

Cahn of the University of Illinois is just publishing a paper on the relation of quail and pheasant.

This is not a closed question. The purpose of this discussion is simply to show that the Illinois Survey has yielded no strong evidence of interference. It has yielded most convincing evidence (also found in other states, especially Iowa) that good quail country and good pheasant country are two different things, with only a narrow overlapping zone, and hence the pheasant is by no means to be regarded as a substitute for quail.

Illinois sportsmen commonly state that "the pheasant has adapted



himself to intensive a riculture through thousands of years of evolution in China" with the implication that he will therefore thrive on the Illinois prairie. Beebe makes it clear that the pheasant is just as dependent on the dense reed-beds of China as he is on the glacial swamps of Illinois, and that he feeds in the paddy fields because they are everywhere intersected with little grass-grown ridges thrown up for purposes of irrigation. When the reeds are cut he takes to the hills.

He apparently needs cover just like any other game.

10 Hungarian Patridge

History of Plants: Relation to Wisconsin Plants The date of the first plantings in the Chicago area has not been accurately determined. The following ought to know best:

| | | | |
|---|---|---|---|
| Evans | St Charles | "Been here 12-15 years" | 1917,18,or 19 |
| Surgent | Waukegan | "Been here 11 years" | 1918 |
| Eldredge | Rochmond | "16-20 years ago." | 1913 |
| Stratton | Ingleside | - - - - - - - - - - - - | - - - - - - - |

The importance of this date is in determining whether the Illinois stock could have come in part from the Pabst plantings in Waukesha County, Wisconsin, which began about 1905 ( W W Cook). Evidently the Wisconsin plantings were the earlier.Tentative Wisconsin data indicates that they had spread into northern Walworth County (on the border north of McHenry County,Illinois) by 1920,and into southern Walworth County by 1923. Since they appeared in northwest McHenry County in 1924 (Wakeley) it seems likely that the northwest McHenry stock is in part Wisconsin drift, although it is probably in large part drift from the Richmond plant of 1913.

That there were plants made as early as 1913 or 14 in northeast McHenry, however, is attested by a 1913(?) plant in Lawrence County, (Hicks) and a 1914 plant in Pratt County (LOdge),both far to the south, and,incidentally,both failures.

Taking the state as a whole,birds were evidently imported in the following years: 1914,1917, 1918 (?), 1919,1920,1921,1925,1927.

Results: Present Distribution Map G shows that there is a thriving establishment in the Chicago area, a small and apparently non-aggressive establishment in Vermillion County near Danville, while all other plants have failed except as follows:

| Date of Plant | County | Result |
|---|---|---|
| 1927 | Madison | "Have been seen 15 miles north of where planted, but have not taken hold." |
| 1925 | Sangamon | "Some seen in 1927. No evidence of taking hold-bare survival." |
| 1925 | Scott | "Heard of in 1927." |

Rumors of a successful plant in Cumberland County were heard, but a letter of inquiry failed to bring a reply.

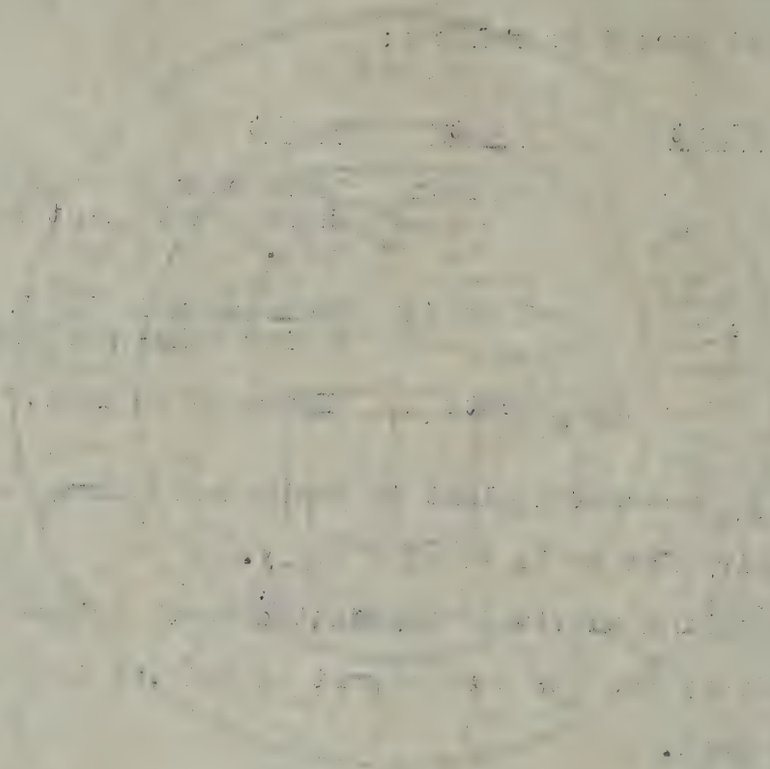
These straggling survivals beyond the south fringe of the really successful territory has its counterpart in Ohio, as is evident from Map F of the Ohio report.

An especially careful study of the Chicago area was made in the belief that if the spread of these birds could be accurately mapped, a comparison of the spread map with a map of soil types might yield valuable indications as to the soils preferred by this species. Map H summarizes the results of this study. The results are not conclusive for two reasons:

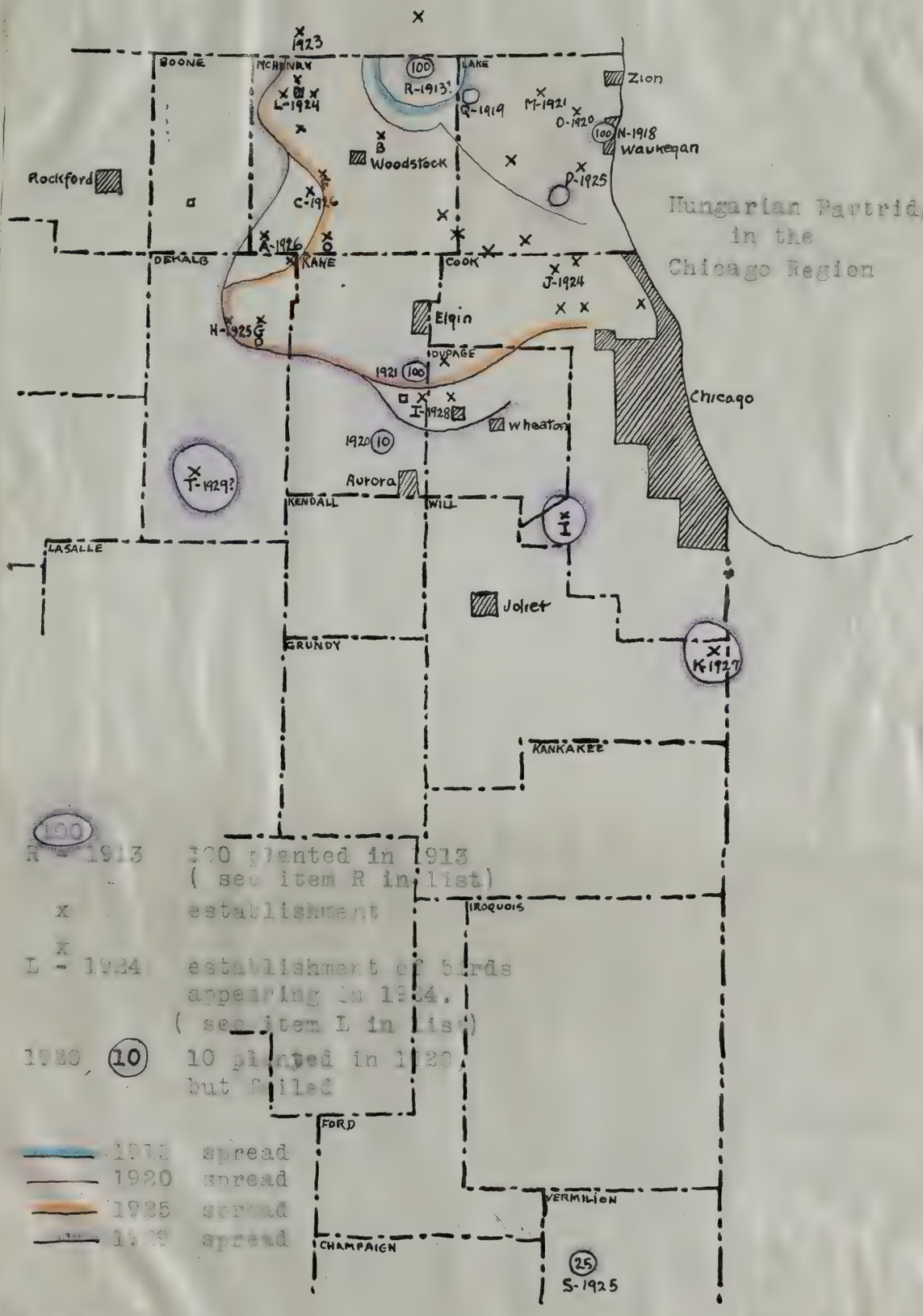
(1) It was found that the birds had not spread from a single center, the spread being confused by numerous plants made during various years.

(2) Only about a dozen instances were found where observers were definitely able to remember the date on which the birds spread into a given locality.

If the idea embodied in Map H could be carried out in enough detail to show spread contours by years instead of by 5 year periods, and if



Map II




Hungarian Partridge
in the
Chicago Region

100 R - 1913 100 planted in 1913 ( see item R in list)

x establishment

x L - 1924 establishment of birds appearing in 1924. ( see item L in list)

1920 10 10 planted in 1920 but failed

1913 spread

1920 spread

1925 spread

1930 spread

the data could be fathered with encugh accuracy to be plotted as an overlay sheet on actual soil maps, it is believed that valuable information would result. If a fellowship on Hungarians is granted to any institution it is believed that this kind of a distribution spread study would be well worth while. Even such rough work as is represented by Map H presents some very interesting suggestions.Why,for instance,should such a map spread occur in the years 1925-6 as contrasted with the smaller spread for 1927-8? In this connection the islands appearing in DeKalb, Gill,and Cook counties may have been thrown off during the 1926 spread rather than later.It is known that the Wisconsin stock made an extra large spread in 1926,and apparently part of the range gathered during that year has since been lost.It is interesting to speculate that 1926 was also near the peak of the last grouse cycle.There may conceivably be a connection between these 2 phenomena,especially in view of the recent discovery that the entire grouse family is involved and the further discovery, by Greene, of a natural case of tularemia in quail.

It looks as though the McHenry County spread of Hungarians had reached its limit,since they have been in the vicinity of Harvard since 1924. This limit is the western boundary of the Lake region already pointed out under pheasants,and is nearly the same for pheasant and Hungarians respectively.

The country included within the Hungarian range in the Lake region looks entirely different from that in which the species was successfully established in northwestern Ohio. The Vermillion County establishment occupies a country which looks very much like the Hungarian range in the vicinity of Defiance, Ohio.

| Group: | |
|---|---|
| A | mail" |
| B | |
| C | ake |
| D | |
| E | |
| F | |
| G | |
| H | |
| I | |
| J | |
| K | |
| L | hem in Walworth Co. |
| M | |
| N | |
| O | kegan.Fewer in 1926 |
| P | |
| Q | |
| R | n Ill. |
| S | |
| T | |
| U | |

Hungarian Partridge in the Chicago Area

| Group | Locality and Description | Location | County | Started | Number | Present No. | Data from (notes page) | Remarks |
|---|---|---|---|---|---|---|---|---|
| A | Big slough (drained) | S. E. Garden Prairie | McHenry | 1927 | | 100 | Williams | Called them "California quail" |
| | | | | 1926 | 8 birds | 2 coveys | Rowan | |
| B | [illegible] | 4 mi. NE Woodstock | McHenry | ? | | 15 in 1928 | Rowan | |
| C | Wilson farm (2nd bottom) | 2 mi. N Marengo | McHenry | 1926 | 1 pair | 2 coveys | Wilson | Thinks came from Crystal Lake |
| | | | | | | | | Heard of these in 1925 |
| D | | 4 mi.S Marengo | McHenry | 1927 | | 1 covey? | Adams | "Been there several years" |
| E | Maloney Slough (drained) | 6 mi.S Margengo | McHenry | or sooner ? | | 1 covey? | Wilson | |
| F | | 4 mi. N Marengo | McHenry | | | | Wilson | |
| G | John Waterman farm | 2 mi. N Sycamore | DeKalb | ? | | 1 covey | Wetzel | |
| H | Anderson farm | 4 mi. NW Sycamore | DeKalb | 1925 or 6 | | 15 birds | Wyman | Using in corn fields |
| I | | Pallar Park | Cook | | | 1 covey | Koragard | seen 1928 |
| J | | N of Mt Prospect | Cook | 1924? | | 5 coveys | Koragard | |
| K | | E of Crete | Wills | 1927? | 2 coveys | | Kennicott | |
| L | | SE & W of Harvard | McHenry | 1924 | | 4-5 coveys | Wakeley | Came from north. Heard of them in Walworth Co. |
| M | | Milburn | Lake | 1921 or sooner | | "plenty" | Brewer | about 1923<br>Thinks a plant made these |
| N | | Waukegan | Lake | 1918 plant | | up to 1 per 6 acres | Brewer | Planted 1918-100 |
| O | Nadelhoffer farm | Guerney | Lake | 1920 | | up to 1 per 4 acres | Nadelhoffer | Seem to have come from Waukegan. Fewer in 1928 than in 1927. |
| P | | W of Lake Forest | Lake | "No runs there 1924" | | | | |
| Q | | Ingleside | Lake | 1919 plant | | | Graham | Fewer last two years. |
| R | | Richmond | McHenry | 1915? plant | | | Eldridge | Thinks Wis birds came from Ill. |
| S | Between Collison & Rankin | | Vermillion | 1925 plant | | 200 | Huff | |
| T | | W of Waterman | DeKalb | | | 2 coveys | Rehm | Seen in 1929 |
| U | | Libertyville | Lake | plant | | | Graham | |

Census Data W C Brewer of Grays Lake, who lives in the best of the Lake County Hungarian range,estimates that there are 50 pairs per square mile in the vicinity of his farm this spring. This is 1 bird per 6½ acres,as compared with 1 bird per 4 acres derived from Maxwell as the average for English estates.Probably double this number,or 1 bird per 3 acres,would be a fair estimate of the fall population. This would represent very good stocking in regular quail country,It may be concluded that the best of the Hungarian range in northeastern Illinois is fully stocked.

Nadelhoffer estimated that he had 8 to 10 coveys on the square mile aurrounding his farm in Lake County last fall,with about 15 birds to the covey. This could be a bird per 4 acres and checks satisfactorily with the Brewer census.

Graham estimates that the ratio between pheasants and Hungarians near Fox Lake is 2 to 1,but that near Libertyville the opposite is the case. Eldredge estimates that in McHenry County ringnecks outnumber Hungarians by 10 to 1,but since he also states that he can flush 100 pheasants per day, this ratio may be considered exaggerated.

Hungarians occupy only a fraction of the total of the block mapped as established range,possibly ¼ of it. Within the occupied ground,however, they may be considered to be just as abundant as quail would be in a good quail country,and possibly nearly as abundant as pheasants are in the same region.

Phenology Brewer found a nest with 4 eggs on April 23,which indicates that April 20 is the date on which laying begins in the Chicago area.

Wilson,who watched a covey all winter on his farm at Marengo,says the covey broke up as soon as the snow disappeared. I was unable to locate any other observers who had seen these birds in covies during April. It

therefore appears that the same tendency toward early mating which is apparent in Europe is also characteristic of this species in Illinois.

Winter Losses Wilson found 2 dead Hungarians under a bush in a roadside snow drift near Marengo this winter. Brewer found 7 after the snow had melted this spring, in the woods, evidently the remains of a covey frozen last winter. This instance of roosting in timber seems of itself worth recording. There is a report that the Wisconsin Hungarians showed a decided tendency this last winter to gather in the neighborhood of gravel roads which were being scraped clear of snow in order to allow milk to be hauled to market. This might indicate that the shortage of grit during snow storms is as serious as the shortage of food. Taken in conjunction with Lodge's statement that all kinds of birds consume as much grit as grain at his feeding station, and the need for a thorough study of winter feeding methods becomes apparent.

11 Prairie Chicken

History The sharptail grouse,as well as the true prairie chicken,was originally found in northern Illinois. Nelson (1887) states that a covey of 14 sharptails was shot at Waukegan in 1863 or 1864. Ridgeway (1895) writing in"Field and Stream" for October 9,1879,says of sharptail:"In 1840-5 this specie was abundant in southern Wisconsin and northern Illinois as far south as Chicago,always frequenting the timber,which gave it the name of burr-oak grouse."

Sharptail grouse must have disappeared from northern Illinois and southern Wisconsin soon after the Civil War. I was unable to find any old-timers who had any recollection of its occurrence in the state.

It is,of course,common knowledge that the true prairie chicken was once very abundant in Illinois. Data on the dates of its most rapid disappearance might prdve to have value in figuring out what to do to perpetuate this species.

Nelson (1887) says the prairie chicken was "once excessively abundant,now rather scarce within 30 miles of Chicago.Still in large numbers on the larger prairies," but decreasing.

Woodruff (1907) says of the prairie chicken,"now fast disappearing.They are occasionablly found in the western portion of Cook County, Illinois,and in Lake County, Indiana."

G W Walker (1897) reports the prairie chicken as a common resident in Boone County at that time.

Musselman (1922) says "Found over entire state but becoming very uncommon in central western part of the state."

Lashbrook told me that chickens were plentiful near Beardstown

until about 1890;that they disappeared "all at once,like the passenger pidgeon." The county of which he speaks was not drained until 1900.

Ewinger told me that chickens were common on the bottom land prairies of Henderson County on the grounds of the old Lone Tree hunting club until about 1916. Since this land was drained in 1912 or 14 the drainage may have been the cause.

Dadant told me that chickens were plentiful in Adams County up to about 1899. This was on black upland prairie.

The other dates of disappearance are included on Map I. Most observers told me that the chickens had disappeared gradually,with no particularly noticeable falling off in any particular year.

Life History Data Dedant told me that in 1863 great numbers of prairie chickens flew into the timber to roost in winter. This was told him by his father and pertains to the family farm in Adams County 2 miles from Hamilton. They are said to have weighted down the trees in these roosts. I particularly determined that these chickens were not coming in to bud, as is the course,common in winter.

In view of the dispute as to whether quail eat chinch bugs it is worthwhile to record a statement by Bowman that he has often found chinch bug in chicken and that their crops are often filled with them in August.

Arthur Hamilton,guide and pusher for George Phelps in the Beardstown area,gave me an account of a flight of chickens which he saw about 1908 while a boy on his father's farm near Elmwood,in west Peoria County. The date,he says,is correct within a year or two,and the month was August,as shown from his recollection of roasting ears being about ready. Hamilton says this flight was headed southward and started in the forenoon,lasting for about an hour."The sky was full of chickens like blackbirds."

They were not flying very high,as many of them hit telephone wires. None were seen to alight.The flight must have covered a considerable front,since Hamilton heard it discussed in Yates City and Oak Hill,several miles away.These birds were said to have come back during the same year,but not in any big or continuous flight.Luke Hurff,the localgame warden,thought the reason for the flight was that the chickens were after some kind of insect which was abundant in the direction in which they were headed.

Another instance illustrating former migrations was related to me by Edward Runge some 20 years ago.Runge said it was customary for chicken hunters to go every fall to North Hill Bluff on the outskirts of Burlington,Iowa,opposite Henderson County,Illinois.This bluff projects into the Mississippi River in such a way as to catch any southward flight of birds along the river bottoms.Runge said that chickens flying southward along the bottoms would be unable to clear North Hill easily and would accordingly alight,where they feel easy prey to hunters.A considerable number was killed there each fall by hunters who arrived at the proper dates. Runge was unable to remember the month in which this annual flight took place.

Present Distribution and Abundance Map I shows an astonishing survival of chickens in Illinois.In a few instances the approvimate number of birds constituting individual remnants was obtained and is noted on the map.The remnants in and around Champaign County are all very small.

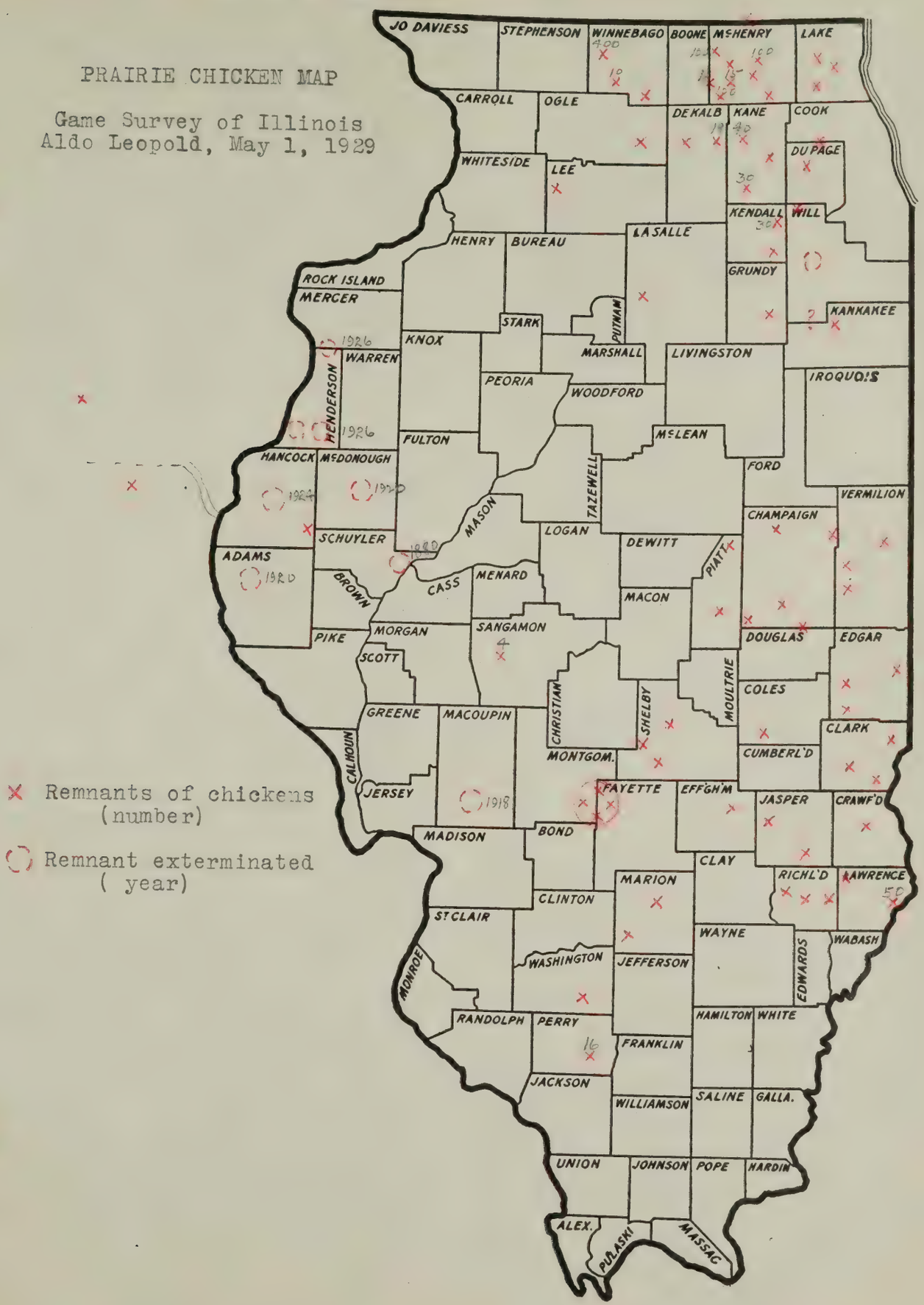
I have the very strong impression that there are at least as many chickens left in Illinois as there are in Minnesota,if sharptail be excluded from the Minnesota estimate. There can be little question about the fact that there are a great many more chickens left in Illinois than in Iowa,and this in spite of the fact that Illinois has had a short open season,since about 1915,whereas Iowa has been totally closed on chickens

Map I

(61481—500—1-27) 2

# PRAIRIE CHICKEN MAP

Game Survey of Illinois
Aldo Leopold, May 1, 1929




× Remnants of chickens (number)

( ) Remnant exterminated ( year)

for many years.

This survival,is, in all probability,in spite of,rather than because of, the fact that chickens are hunted. The strong survival is not surprising for the Lake region or northeastern region of Illinois because that is a hummock swamp country similar to Wisconsin.It is very surprising that any chickens at all should survive in the region of Champaign County,because all of the sloughs are drained and there is hardly a vestige of unplower prairie cover.Further south in the old glaciated prairie the soil is much poorer and consequently farming is less intensive,which may in a general account for the survival of chickens there.

The almost complete disappearance of chickens in the western part of the state is a mystery when compared with their survival in the east and northeast.

Looking at the situation in a broad way,there must be some special reason to account for the excellent showing of the state as a whole. It is possible that chickens are making their last stand here rather than further toward the northeast,for the same reason that the buffalo made their last stand on the Colorado plains in spite of the gact that hunting had driven them across the mountains into the Great Basin country.They were exterminated from the Great Basin before they were exterminated from Colorado,possibly because the Great Basin was not their indigenous habitat and they were less perfectly adapted to it.

Wisconsin,Minnesota,and the Dakotas were probably originally predominated sharptail country rather than prairie chickencountry,but the chicken followed grain farming into these regions from its original home in Iowa and Illinois. It might, however,show less resistance to extermination in its acquired range than in its original range.

The flaw in this theory is the almost complete disappearance of chicken from Iowa,where they were certainly a native species.

Conservation Methods Practically every surviving remnant of chickens shown on the map is associated with some accidental survival of special cover. This fact, taken in conjunction with the known fact that the species has a wide seasonal cruising radius, indicates that a proper system of special refuges might successfully conserve the species for a long time to come. Such a refuge system should aim primarily to preserve remnants of slough and swamp cover. This is the same kind of land as should be sought for pheasant refuges, and the co-existence of the two species in the northeast indicates that there would be no serious conflict between them. It also seems obvious that the open season on chickens should be discontinued, at least until a dependable system of refuges has been put into effect.

Fluctuations Between Years Special inquiry was made throughout the chicken country to get the date of any high and low years in local chicken populations. I was unable to find any trace of such fluctuations, which are usually remembered by sportsmen for any species on which an open season exists. It may very well be that the remnants in Illinois are so isolated that they are exempt from the diseases which appear to sweep the more northern habitats, in the same way that ruffed grouse in Ohio and Illinois appear to be exempt from the northern shortages.

## 12. Waterfowl

No attempt was made to cover the waterfowl situation comprehensively. Only such information was gathered as bears on the land problem, plus certain fragments which might be useful to the waterfowl survey conducted by the American Wildfowlers in co-operation with the Biological Survey.

Shrinkage of Waterfowl Range. Map J. is a photographic reduction of a colored drainage map published by Pickels & Leonard, 1921. Probably most of the colored areas (showing dark on the reduction) were originally to some degree the habitat of waterfowl. When this is compared with the important remaining habitats (outlined in red ink) the enormous shrinkage of waterfowl ground through drainage can be appreciated. Small wonder, then, that so long as there are any waterfowl left at all, they should appear to be "abundant" on these remnants of the former range, especially on baited remnants like the Illinois River bottoms.

Forms of Tenure. Duck ground is held in 5 ways:

(1) Clubs. Group, for sport.

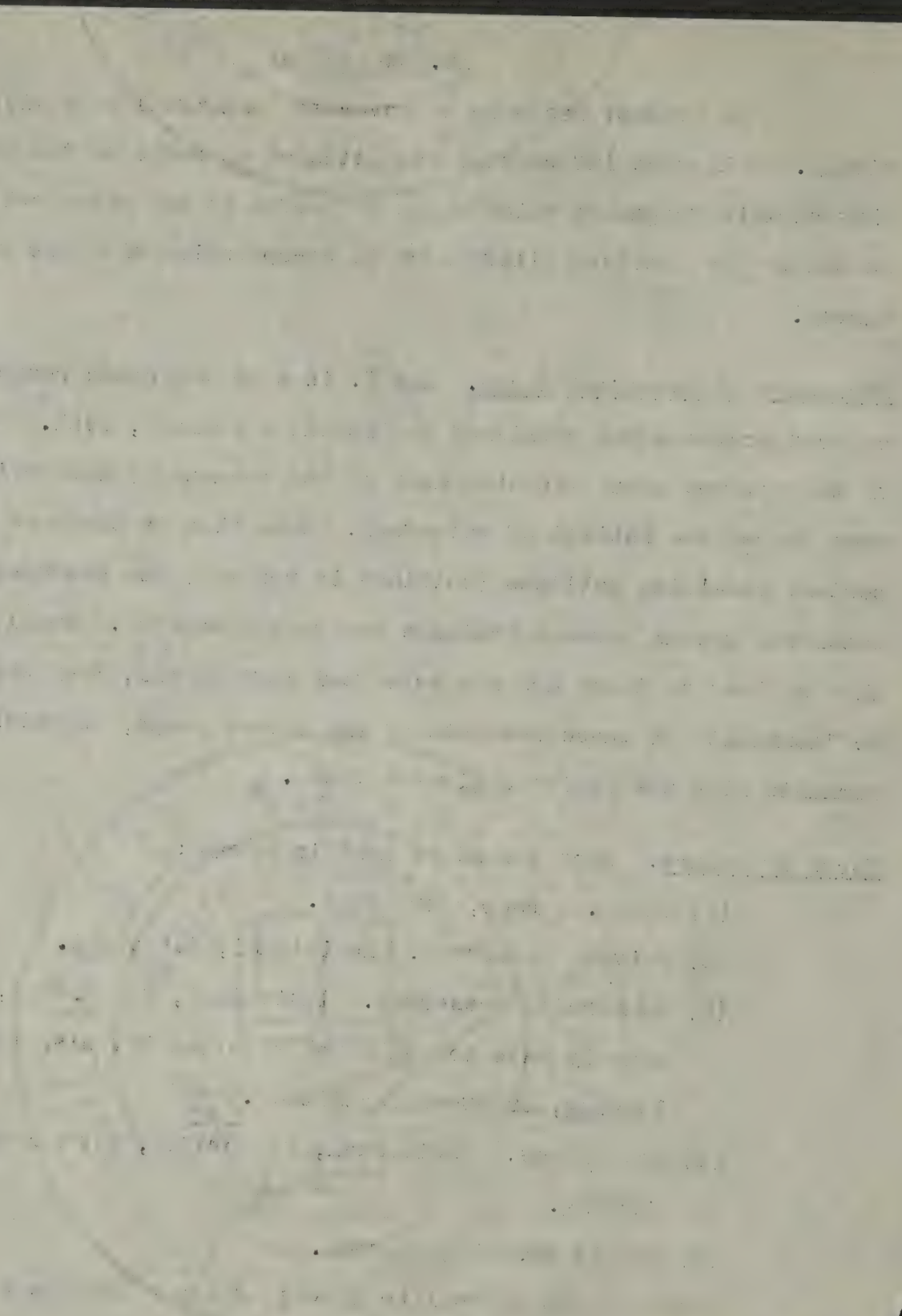
(2) Private preserves. Individual, for sport.

(3) Commercial preserves. Individual, for profit, but charge is usually made not only for shooting but also for board, lodging, or other facilities.

(4) Toll farms. Individual, for profit, but incidental to farming.

(5) Public shooting grounds.

There is not sharp line between Class 3 and Class 4. Class 5 does not yet exist to any extent (see Map O). Classes 1 and 2, and sometimes



Map J

(61481—500—1-27) 2

3, may be either leased or owned.

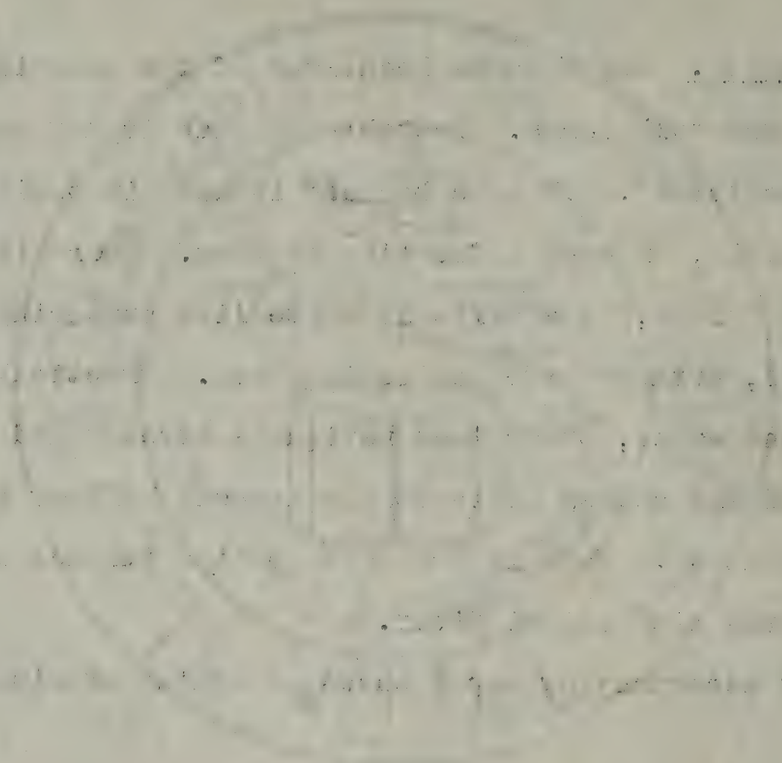
Duck Clubs & Preserves. Map K shows locations of the more important duck clubs, preserves, and toll farms. Probably the map is not consistent in the definition of "importance". This is because it was impossible to visit each ground separately, or even a fraction of them. There is a very great number of licensed "clubs," the official state list numbering about 400, including forms 1,2,3, without differentiating them. Practically all of the available ground and water, other than navigable streams and state lakes, is privately held, and the shores of these are largely held by clubs or other forms of private control. This is true even of the islands and sandbars and the points of the Mississippi River.

The list accompanying Map K shows something of club practices and tenure.

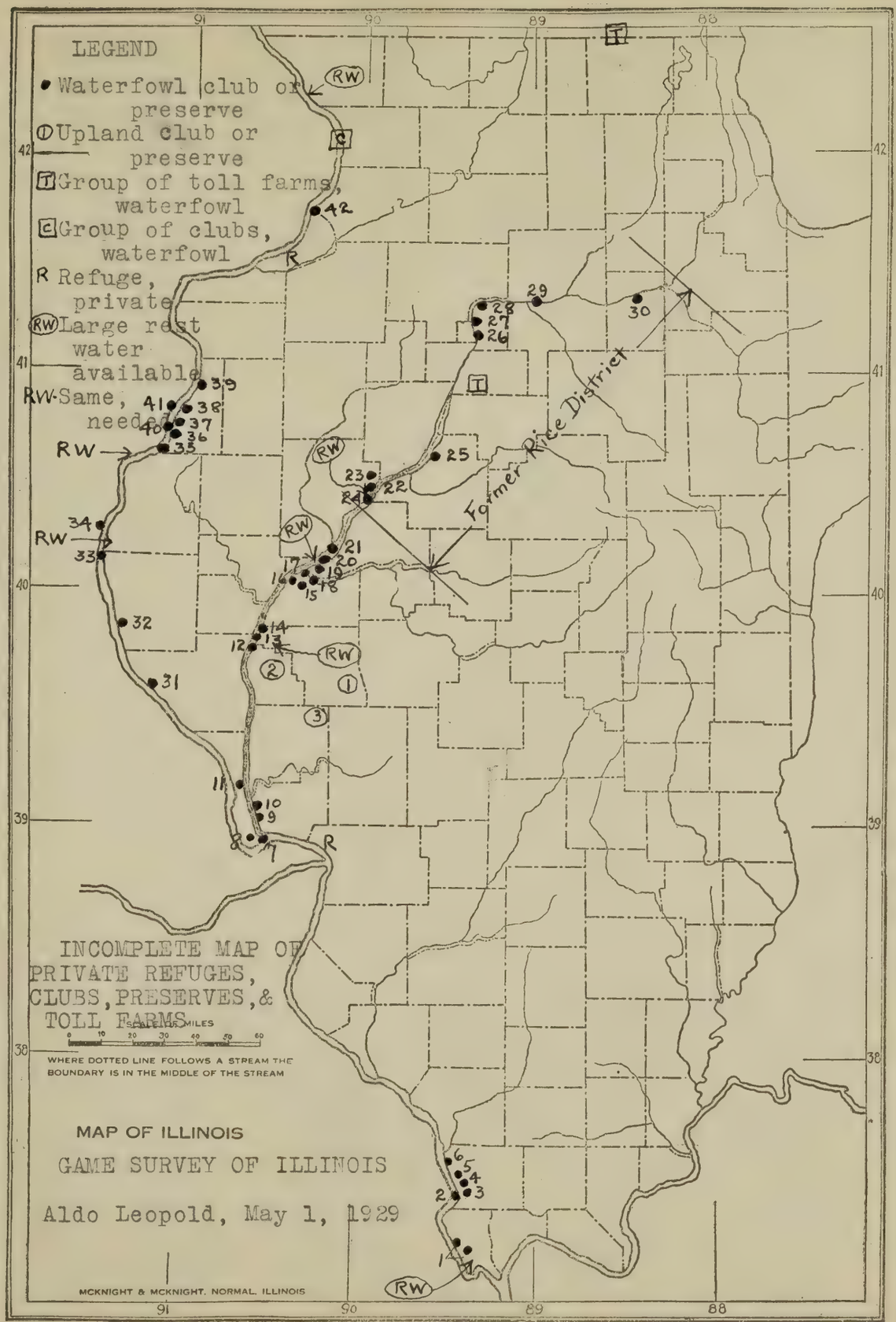
Private Refuges. I was able to learn of only 6 clubs which had set aside a definite part of their holdings as a refuge. One club (Crystal Lake, Henderson County) abandoned the refuge idea after trying it out very successfully. Not every club has the physical layout suitable for use of refuges, but even after making due allowance for this fact, the existence of 6 refuges on 400 private holdings indicates an exceedingly slow spread of the refuge idea, which in turn is an excellent indicator of the spread of other ideas on intelligent game management. It may possibly have to be set down as a fact that clubs do not act on the refuge idea until they have to, either through coercion or shortage of game.

Some commercial preserves maintain refuges.

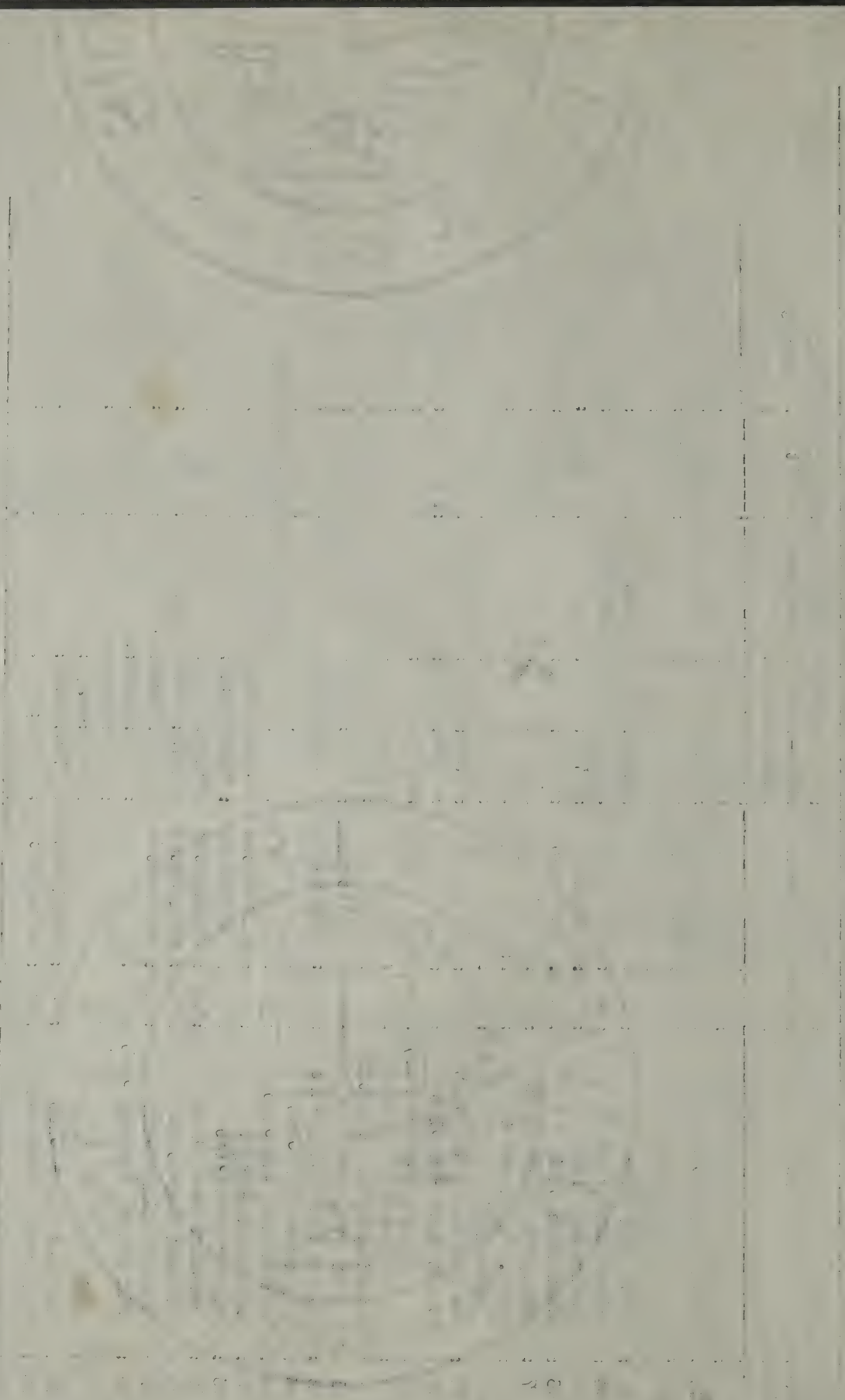
There is one successful private refuge on the Elsa Farm near Alton.



Map K


LEGEND
• Waterfowl club or preserve
① Upland club or preserve
T Group of toll farms, waterfowl
C Group of clubs, waterfowl
R Refuge, private
RW Large rest water available
RW-Same, need
Former Rice District
INCOMPLETE MAP OF PRIVATE REFUGES, CLUBS, PRESERVES, & TOLL FARMS
STATUTE MILES
0 10 20 30 40 50 60
WHERE DOTTED LINE FOLLOWS A STREAM THE BOUNDARY IS IN THE MIDDLE OF THE STREAM
MAP OF ILLINOIS
GAME SURVEY OF ILLINOIS
Aldo Leopold, May 1, 1929
MCKNIGHT & MCKNIGHT, NORMAL, ILLINOIS
91
90
89
88
42
41
40
39
38

| Section | Name | Kind | People | Acreage | Owned or leased | Refuge | Bait | Toll charge |
|---|---|---|---|---|---|---|---|---|
| 22 | Duck Island Club | C | various (Geo Luthy, Peoria) | 2700 | | open lake | started 1928 | |
| 23 | Rice Lake Club | P | | 2000 | | no | | |
| 24 | Clear Lake Club | C | | | | open lake | | |
| 25 | Pekin Gun Club | C | Pekin | 700 | | yes | yes | |
| 26 | Swan Lake Club | C | Chicago | | | | | |
| 27 | Group of small clubs, incl. "Mallard" & "Bluewing" | | | | | | | |
| 28 | De Pue Rod & Gun Club | | | 1500 | | | | |
| 29 | Split Rock Gun Club | | | 300 | | | | |
| 30 | (Bob Becker) | | | | | | | |
| | Mississippi above Grafton | | | | | | | |
| 31 | Grisby Preserve | P | Pittsfield | | own | | | |
| 32 | Big Lake Hunting Club | C | Quincy | 300 | own | | | |
| 33 | Taylor Island Club | C | | | | | | |
| 34 | Alexandria Gun Club | C | | | | (Kill of 800 ducks, 1928) | | |
| 35 | Ideal H & F Club | C | Burlington | 500 | own | | | |
| 36 | Silver Lake Club | C | Galesburg | 300 | both | | | |
| 37 | Carthage Lake Club | C | Burlington | 100 | | | | |
| 38 | Crystal Lake Club | C | Burlington | 1275 | own | no | no | |
| 39 | Benton Island Club | C | Burlington | | own | | | |
| 40 | Big Island Hunting Club | C | | | lease (Power Co.) | | | |
| 41 | Cascade H & F Club | C | Burlington | 700 | both | | | |
| 42 | A J Ferber Preserve | P | Davenport | | | | | |



T = Toll C = Club
P = Preserve

Waterfowl clubs and preserves -- Illinois

| Section | Name | Kind | People | Acreage | Owned or leased | Refuge | Bait | Toll charge |
|---|---|---|---|---|---|---|---|---|
| | Mississippi below Grafton: | | | | | | | |
| 1 | Claude E Clinton, Goose Pres. | T | | | lease | adjoining horseshoe | | |
| 2 | Blue Goose Club | ? | | | lease | L. | no | |
| 3 | Bluff Lake Club | C | | | | | no | |
| 4 | E.St.Louis R & C Club | C | E.St. Louis (N R Huff) | 300 | owned | no | no | |
| 5 | ? Goose Preserve | C | ? | 300 | lease | no | no | |
| 6 | ? | C | ? | ? | ? | | | |
| | Illinois River | | | | | | | |
| 7 | Olin Preserve | P | | 850 | own | | | |
| 8 | Reer Plain Club | C | St. Louis | 3000 | lease | | | |
| 9 | Smiley's Club | | St. Louis (Mockerman) | | | | | |
| 10 | Glades Club | C | Alton | 750 | | | | |
| 11 | Alton Hunting Club | C | Ill.Glass Co | 300 | | | | |
| 12 | Smith Lake Club | C | Chicago | | | | yes | |
| 13 | Roy L Phelps | T | | | | | yes | $15 per day |
| 14 | Chicago-Meredossa | C | Chicago | | | | yes | |
| 15 | Rock Island Club | C | Rock Island | | | yes | yes | |
| 16 | Bushnell Club | C | Bushnell | | | | yes | |
| 17 | Cartwright Club | C | Springfield | | | | yes | |
| 18 | Sangamore Club | C | Chicago | | | yes | yes | |
| 19 | Crane Lake Club | C | Chicago | | | | yes | |
| 20 | ? Island Club | C | Chicago | | | | yes | |
| 21 | Grand Island Club | C | Chicago | | | yes | yes | |

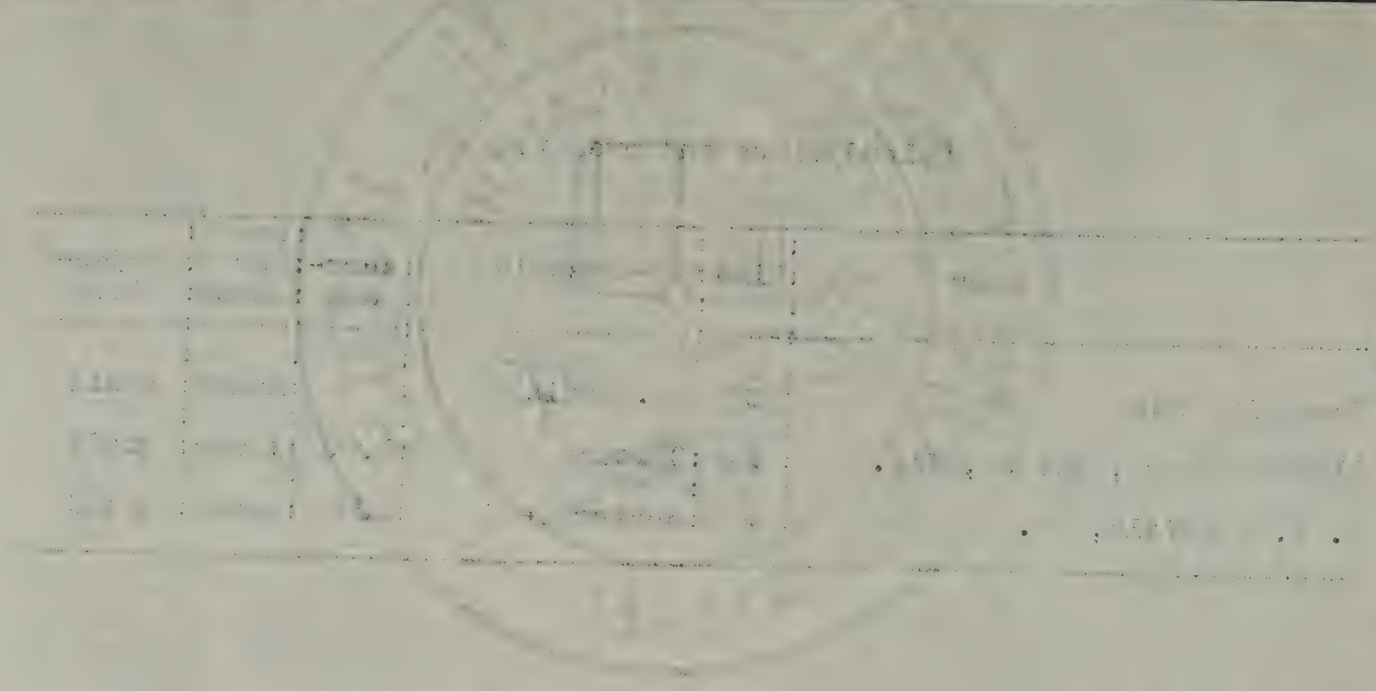
Cont'd.

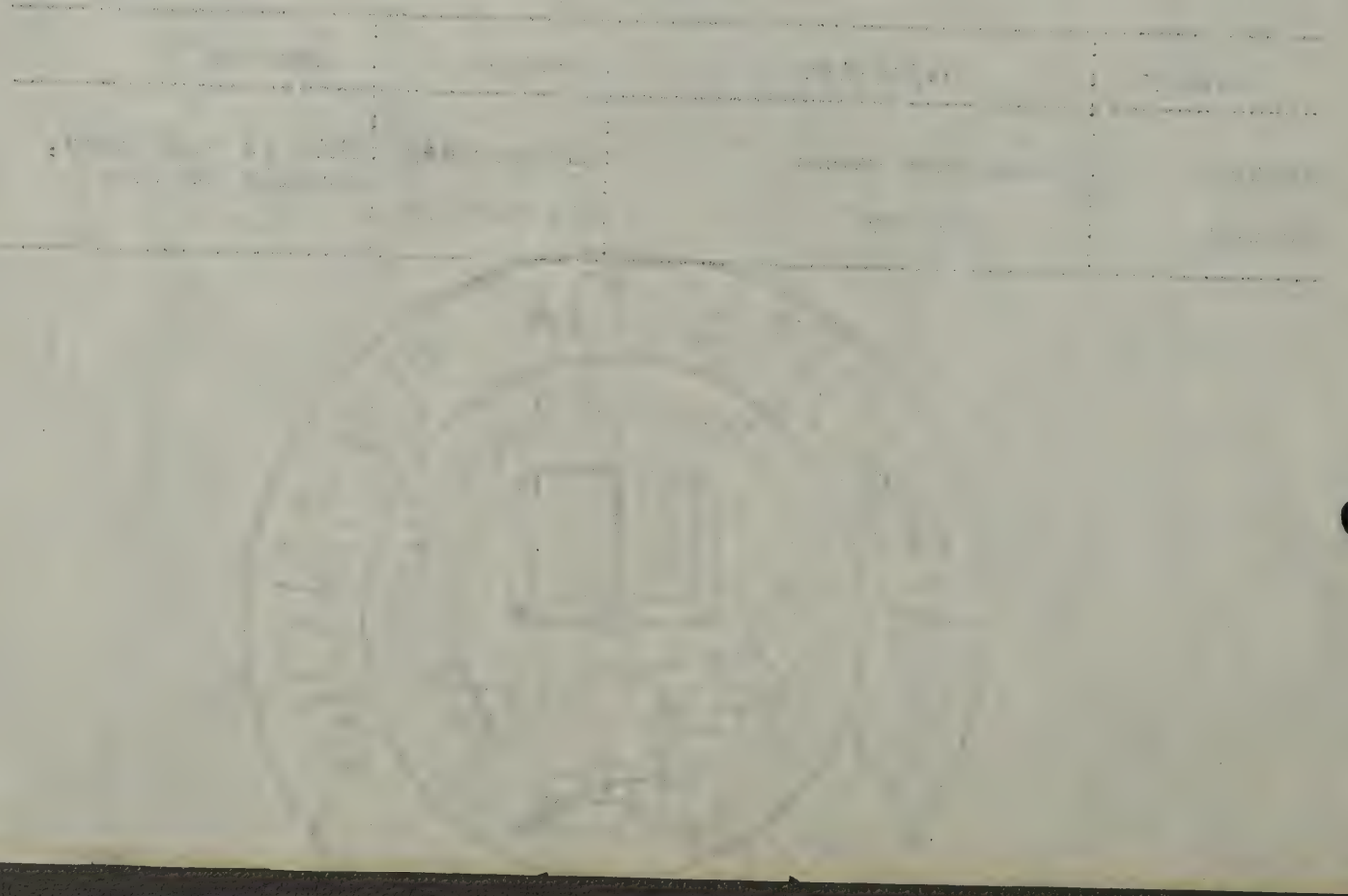
Upland clubs and preserves

| Name | Kind | People | Acreage | Own or Lease | Objective |
|---|---|---|---|---|---|
| Franklin Club | C | St. Louis | | lease | quail |
| Clayton Berry, Exeter, Ill. | P | Chicago | 1000 | lease | quail |
| C. F. Mansfeld, Jr. | P | Springfield | 2000 | lease | quail |

Groups of toll farms

| County | Objective | Charge | Remarks |
|---|---|---|---|
| Marshall | Ducks and geese | $15 per day | This is dray land, heavily baited. |
| McHenry | Geese | $15 per day | |





and another maintained by the military authorities on the Rock Island arsenal. No others were heard of. There are numerous excellent opportunities for farm refuges, especially in the lake region of the northeast.

Baiting is universal on all private duck grounds along the Illinois River, but is not practiced in the other part of the state. The amount of grain used per season is indicated by the following instances:

| Instance No. | Year | Bushels Corn | Acres | Bushels per acre | Remarks |
|---|---|---|---|---|---|
| 1 | 1928 | 1,300 | 3 | 430 | On refuge |
| 2 | 1928 | 6,600 | 20 | 330 | |
| 3 | 1928 | 7,000 | ? | ? | Per season 1 club. |

Corn is usually used for mallards, but barley is used where canvas-backs are to be baited.

Baiting is also practiced on dry grouns, often far removed from water, especially on the sandhills in the bend of the Illinois River in Marshall County. One commercial preserve operating a dry bait ground of 40 acres is said to have yielded a kill of 4,000 ducks in 60 days, or 100 ducks per acre per season. When this is compared with the duck-producing power of even the best acre of breeding ground, the real meaning of the words "concentration area" becomes more apparent.

Shooting Practice as to Guns & Flocks. Per Cent Cripples. Commercial preserves and toll farms place 6 or even 10 guns to a single "pen" of live decoys. It is frequently compulsory to shoot only at flocks small enough to be cleaned up. One objection to dry bait grounds is that the flocks which come in are too large to be "cleaned". Pot-shooting on the water or ground is prevalent, especially on commercial preserves and toll farms.

The following estimates of per cent of cripples lost were obtained from "pushers," guides, and wardens: Lashbrook 33%, Hamilton 50%. This means that for every 10 ducks bagged these men estimate there are 3 to 5 hit and injured but not recovered. It sounds extra high. My per cent of cripples on ducks on the Rio Grande in NewMexico ran:

| | |
|---|---|
| 1919 - 10% | 1922 - 7 % |
| 1920 - 17% | 1923 - 18% |
| 1921 - 11% | Average - 13% |

This was with an extra competent dog and special care. The flooded timber of the Illinois River presents an extra difficult condition as to recovering cripples.

Practice as to limits and hours. The federal warden is authority for the statement that all but one or two clubs observe the federal limit of 25 rather than the state limit of 15.

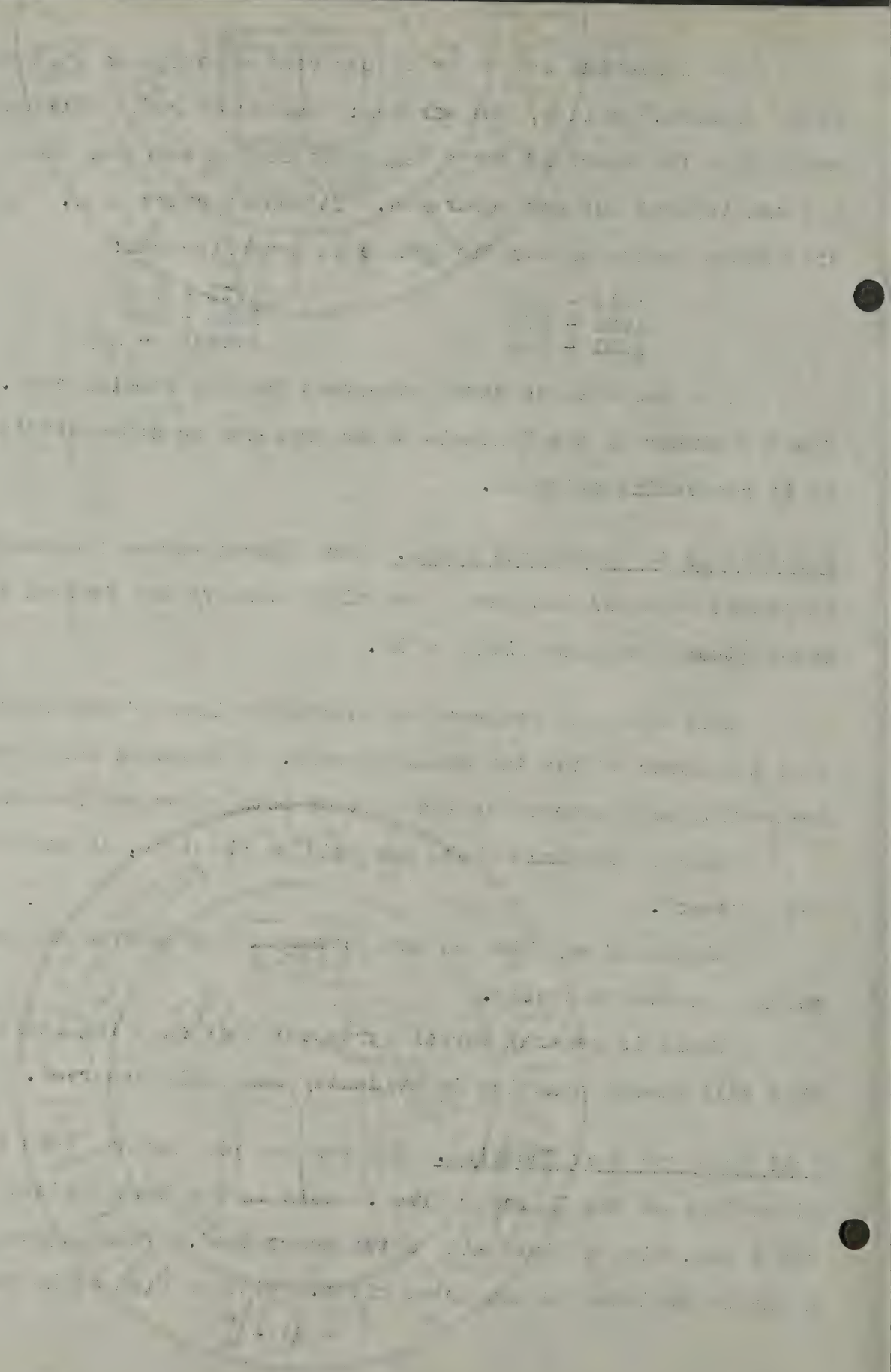
This seems to reverse the underlying idea of the migratory bird law that the lower of the two should govern. I gathered that the practice meets with acquiescence on the part of both state and federal wardens.

Some of the main clubs are said to shoot 30, 15 each for the hunter and "pusher".

Limits of any kind on some commercial preserves and toll farms are poorly observed probably.

There is general verbal agreement that shooting starts at 9 o'clock. This enlightened practice is evidently generally observed.

Toll Rate for Duck Shooting. $10 per man per day has been the going rate since 1914 on the Illinois River. This is now being raised to $15, or $25 for 2 men, with a limit kill often guaranteed. This higher rate is apparently established on the lower river. With as high as 10 guns per pen this



means a gross revenue of up to $150 per day per pen. One variation of this new rate is $1 per duck.

Rentals and Sale Values of Duck Lands. The shooting on $10 land in the Jonesboro section on the Mississippi rented, in one instance for 10-20¢. On the Illinois no rental figures were obtained.

Sale values of duck lands in the Beardstown region, in farm-sized blocks, run from $150 to $300 per acre. At the mouth of the Illinois duck lands run near $50. A maximum price of $400 is sometimes reached in the Beardstown area. Dry land pens have sold for as high as $100 per acre in 40-acre blocks.

Reversions from Drainage. Values of land drained vs. undrained. No reversions from drainage have as yet occurred, but it is current talk that the Chatauqua and Cooke levee districts, broken in a recent flood, may be allowed to revert because their ducking value exceeds their agricultural value.

Table L gives a very rough comparison of the economic status of drained and undrained farms, the former being assumed to be susceptible of development as duck lands. Of course not all undrained lands are of this class.

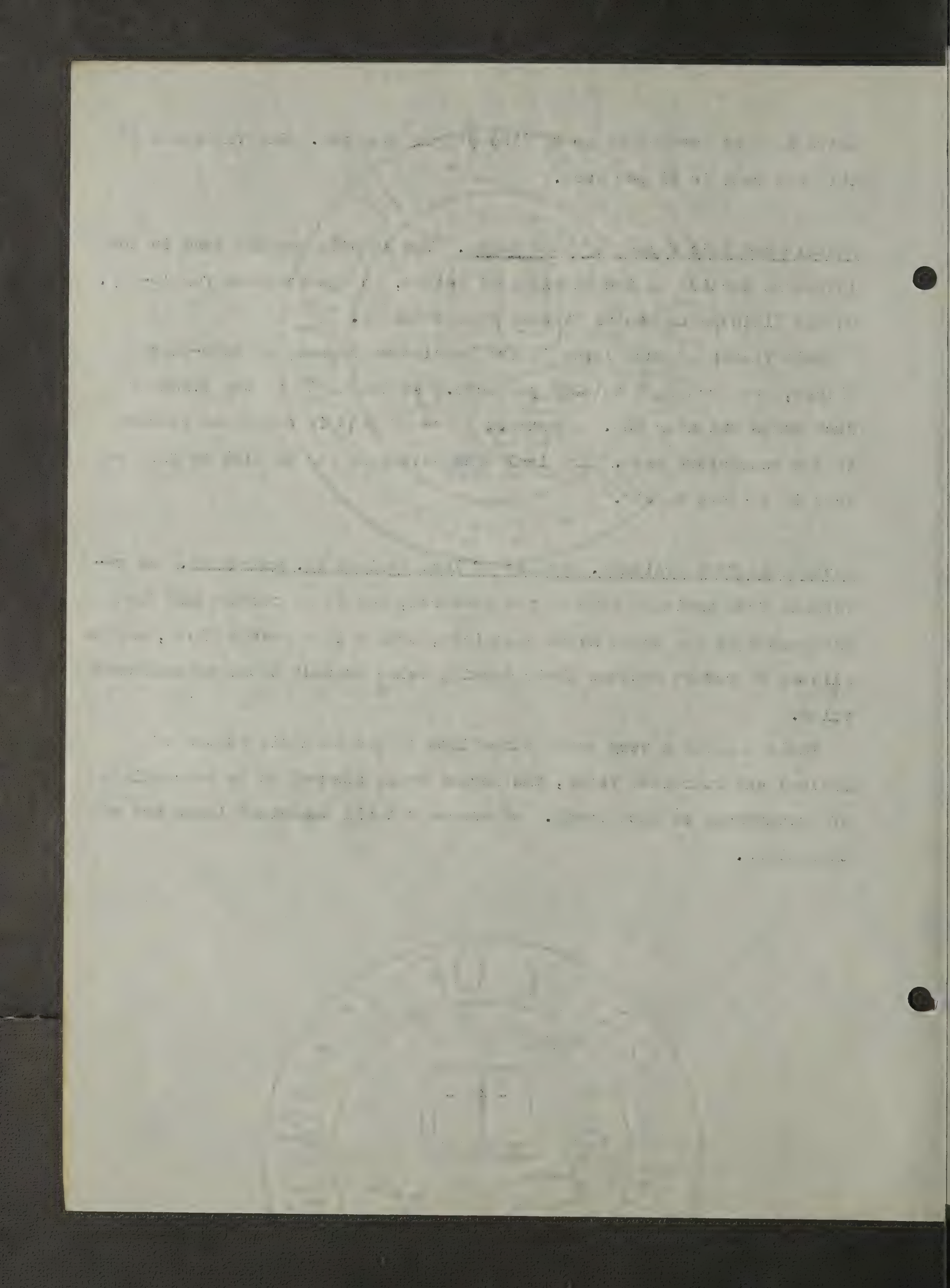


TABLE L

Economic Status of Illinois Bottomland
Farms with Respect to Drainage and Game

| | 1910 | 1918 | 1928 |
|---|---|---|---|
| **Undrained** | | | |
| Sale Value | 40 | ? | If duck land-$250 |
| Flood Risk | 1/3 | same | same |
| Per Cent Tillable | 1/3 | same | same |
| Bu. Corn Per Acre | 50 | same | same |
| State & Country Taxes | ? | ? | 1.50 or 2.00 |
| **Drained** | | | |
| Sale Value | | $250 | $80 |
| Flood Risk | | 1/8 | 1/8 |
| Per cent Tillable | | all | all |
| Bu. Corn Per Acre | | 50 | 50 |
| Drainage Payments, Pumping | | 1.50 | 1.50 |
| State & Country Taxes | | 1.25 | 1.25 |
| Levee Maintenance | | 1.00 | 1.00 |
| Interest and Sinking Fund | | 5.00 | 5.00 |

Note: The purpose of this tabulation is to compare the economic status of typical drained and undrained bottom lands such as are found along the Mississippi and Illinois rivers. The figures do not purport to be accurate or representative. If they are anywhere near right, however, the undrained land is better off. It is hoped that this rough comparison may provoke a more accurate comparison by other more competent persons.

Dates of Flights. (arranged north to south)

| Observer | County | Area | First Main Flight | Second Flight (freeze-up) |
|---|---|---|---|---|
| Leopold | Henderson | Crystal Lake Club | Nov. 7 | Nov. 20 |
| Lashbrook | Morgan | Meredosia | Nov. 20 | Dec. 10 (?) |
| Olin | Calhoun | Crafton | Nov. 10 | Nov. 20 |

The belief is current that the mallards of the second flight are different. All agree they have redder legs. In the Beardstown section they are believed to be smaller. It seems possible that the leg color is simply a seasonal progression.

Rice Areas. Luthy says the Illinois River area from Chillicoth to Liverpool was formerly rice country. It has now been killed out by high water and carp, of which he considers the former more damaging. This was the tall rice, attaining a height of 10 feet.

Rice is reported as formerly thick on Leech Lake, now drained, at the junction of the Kankakee and Des Plaines. Some believe this was artificially planted.

Roshen says Duck Island and Rice Lake had indigenous rice and still have some.

This does not purport to be an adequate survey of either the original or present distribution. Such a survey should be made, as it bears on management of duck lands.

Pollution & Carp. The Des Plaines is considered almost spoiled to its mouth by pollution. The Kankakee is said to be largely spoiled by Carp.

Breeding Areas. There is a widespread belief that the bottoms of central and lower Illinois are not suitable as breeding grounds for ducks, except wood ducks.

It is said to be difficult to raise mallard decoys in the southern bottoms; that they have to be taken to the uplands to breed successfully.

Whether this is true, and whether, if true, it respresents an inherent environmental condition not susceptible of control, or merely some natural enemy like turtles, is an unanswered question meriting real research.

At Meredosia Lashbrook says there are practically no breeding ducks except wood ducks, of which perhaps 1,000 raise yearly on Meredosia Island. On the other hand Hamilton reports an appreciable increase of breeding mallards in 1928.

Luthy estimates perhaps 100 mallards and 200 wood ducks raised on Duck Island in 1928.

Musselman estimates Lima Lake raised 5,000 mallards and 500 wood ducks in 1928.

Roshen says there was a large hatching of mallards in 1928 from Beardstown to above Havanna in the flooded cornfields behind broken levees.

Eldredge says Grass Lake in Lake County raises many mallards and teal.

Crystal Lake Club in Henderson County raises many wood ducks but practically no mallards.

If there is no immovable obstacle to mallards breeding in Illinois, then it should be possible for clubs and farmers to raise large local stocks by letting pinioned birds raise young to join the flight. This is the method being tested by Cox at Winona, Minnesota.

Rest Grounds. The concentration of ducks into limited areas is a matter of spilled milk, too late to lament. The abuses growing out of that concentration are not all subject to affective control. There is one effective offset to those abuses, however, which is easy to control and which is

therefore of outstanding importance. That offset is the establishment of effective rest grounds or refuges.

The small extent of club refuges has already been described. It now remains to consider what large bodies of water offer natural rest grounds, or could serve as such if properly owned and managed. The areas discussed in the following paragraphs are shown on Map K.

Crane Lake, 20 miles below Havana, Roshen says rests up to 3 million ducks. It was once given to the state by the Crane Lake Club as a refuge, but the gift was recalled because of abuse.

Clear Lake, 15 miles above Havana, Roshen says rests up to 3 million ducks. This is a refuge of the Clear Lake Club.

Meredosia Bay rests up to half a million ducks. It has no status as a refuge, but serves as one.

These three waters are undoubtedly the backbone of the Illinois River area, both as to the welfare of ducks and shooting. The outstanding need is to make new rest areas so as to bring the individual units closer together. River Lake is regarded by some as a suitable location for an additional public refuge. If there could be a few additional large public rest waters and many additional small private refuges, the general "conservation flavor" of the Illinoise River would be much improved.

The Mississippi is without rest lakes from the federal refuge at Savanna to the State Refuge at Horsehoe Lake, a distance of 400 miles. Cooper Lake, behind the power dam at Keokuk, would be a half-way station of great value. Manufactured "islands" and like devices for shooting now largely interfere with the functioning of this lake as a restground. The Power Company derives some revenue from leasing submerged islands, but the uses to which these leases are put seem illegal under both state and federal law. It remains to be seen whether the Company will co-operate with the

Biological Survey in establishing a federal refuge on Cooper Lake.

Cooper Lake is said to be silting up rapidly, 10-foot deposits having been found over one pipeline put in 11 years ago and recently pulled up.

Horseshoe Lake was purchased by the state and is operated as a refuge. Huff says 1,000 to 1,900 geese were counted there at various times last winter, and about an equal number of mallards. Olin says the refuge has improved the goose shooting 100 per cnet.

It contains 2,720 acres, for which $199,000, or $73 per acre, was paid out of the conservation fund. Drainage was threatened, and would have cost $50 per acre. One possible fault of this otherwise admirable refuge is that commercial preserves have been allowed to get control of all the surrounding country.

Horseshoe Lake geese are said to decline rye fields and to eat wheat only.

Fox Lake in Lake County is nominally a refuge but is occasionally opened to shooting during certain limited periods, and is therefore not properly classified as such. This and most of the other lakes in the northeastern part of the state are largely a mud hen proposition, but doubtless could hold considerable ducks with a proper refuge system.

Lima Lake in Adams County is understood to be both a valuable shooting and resting ground and is now threatened with drainage. It is owned by D.M.Cummings of Chicago. Several previous attempts were made to drain it, but were unsuccessful. Local sportsmen are advocating its acquisition under the Norbeck bill.

Inland Waters. In Illinois there is the same evidence as in Ohio of the deterioration of shooting on such second class or inland waters as remain undrained. In the vicinity of Lawrenceville, for instance, good shooting

was formerly had on the Embarras River, but there has been practically none since 1919. Shooting on the Ohio and Wabash, which are of second rate attractiveness to ducks, seems to be poor.

Jacksnipe. Roahen says that jacksnipe are holding up well throughout the flooded districts along the Illinois River. Rowan reports them holding up fairly well in Boone County and states that they are not hunted hard. It should be remembered, however, that jacksnipe have lost an even heavier proportion of their former range than ducks, and that the persistence of fair numbers on the remaining concentration areas does not necessarily constitute evidence of a satisfactory condition.

Summary. The foregoing paragraphs are intended to give a rough picture of the waterfowl situation in Illinois. It was impossible to run down and verify all of the facts and opinions cited. Even should some of those facts and opinions prove incorrect, however, the situation presents certain unmistakable tendencies which may be stated as follows:

(1) All waterfowl ground has suffered an enormous shrinkage; much greater than even the average sportsman or conservationist realizes.

(2) The remaining second class grounds have practically lost their shooting and their ducks.

(3) The remaining first class grounds retain their fowl principally by baiting, but this is bound to prove self-destructive unless accompanied by development of adequate refuges.

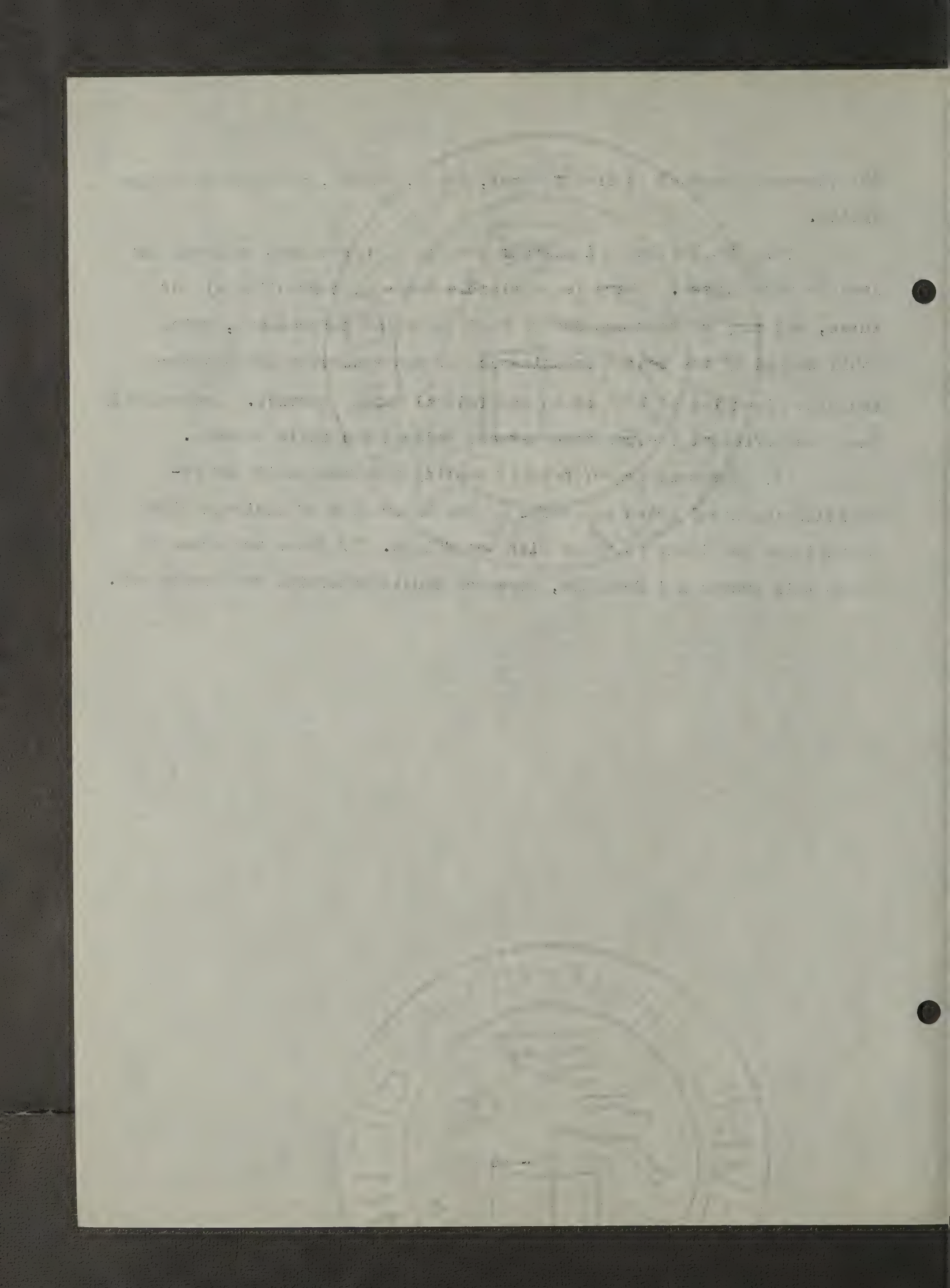
(4) The remaining first class grounds are all in private hands.

(5) The development of refuges, both public and private, is discouragingly slow. A welcome exception to this general tendency is the refuges dedicated by some of the large clubs. The most obvious fundamental need is

the vigorous prosecution of a federal, state, county, and private refuge system.

(6) The baiting and private control of concentration areas has lead to many abuses. There is no visible means of correcting all of these, but many of them are due to inadequate law enforcement, which could be had by the better organization of state wardens and the more adequate financing of both state and federal warden service. Incidentally there is deficient co-operation between federal and state wardens.

(7) There is urgent need of testing the feasibility of re-establishing local breeding stocks by the liberating of pinioned birds to nest and let their young go with the flight. If there are areas on which this proves not feasible, research should determine the reason why.



## 13. Rabbits

Table M summarizes the information obtained on fluctuations on rabbit populations in Illinois. A particular effort was made to find out how large these fluctuations were and whether they occurred uniformly over large regions. Table M shows quite conclusively that in many regions they are barely perceptible, that in the most extreme cases they hardly exceed 50%, and that there is nothing approaching simultaneous shortages either throughout the state or throughout large parts of the state. The behavior of rabbit populations is such as might be accounted for by fluctuations in weather, reinforced by some disease or diseases effecting a relatively small proportion of the total population. There is certainly nothing to approach the sweeping epidemics characteristic of snowshoe rabbits in the north woods.

The data included in Table M ought to be of value in the studies of wild rabbit diseases about to be undertaken at the University of Minnesota.

A doctor in Lawrenceville is said to have had 5 human tularemia cases during the winter of 1927-28 and a few cases in 1928-29.

One human tularemia case was heard of at Libertyville in Lake County in 1928.

Rabbit hunting privileges are evidently becoming sufficiently scarce in the chicago region to warrant the leasing of lands for the purpose. One farmer west of Batavia is said to have leased his rabbit hunting to Chicago people.

The "holing up line", above which rabbits frequent holes in the ground after the inception of cold weather, but below which they continue

TABLE M

Rabbit Shortages in Illinois

| Observer | County | Year | Remarks |
|---|---|---|---|
| Walter F. Leuth | Champaign | 1928 | Extra scarce in 1928. Out 1 day, saw only 2. |
| H. H. Tuttle | Sangamon | 1928 | |
| ? | Brighton | 1928 | Very plentiful near Brighton |
| | Alton | 1928 | Scarce |
| D. R. Abernathy | Lawrence | 1928 | Plenty (A few human tularemia cases) |
| | | 1927 | Scarce (5 human tularemia cases) |
| | | 1926 | Scarce |
| | | 1925 | Plenty |
| Geo. Luthy | Peoria | 1927 | Extra scarce in 1927 due to rains and floods |
| | | 1928 | Normal |
| Frederic Leopold | Henderson | 1928 | Very plentiful |
| Wm. Ewinger | Henderson | 1924 & 5 | Plentiful, Henderson Co. |
| | | 1926,7,8 | Scarce, Henderson Co. (All hole |
| Stephen Rigney | Stephenson | 1925 or 6 | Extra plenty (up in |
| | | 1888 or 9 | Very thick (very cold |
| | | 1893 | Dimly remember a shortage (weather. |
| | | 1928, 9 | Below average |
| Jack Wilson | McHenry | 1928 | High. Max. fluctuation not over 50% between years. (All hole up in cold weather) |
| Warren Rowan | Boone | | "About the same every year for 20 years. Can see as high as 50 per day." No cases of human tularemia. |
| B. A. Wyman | DeKalb | | "Never very short. Hole up in cold weather." |
| W. C. Brewer | Lake | 1928 | Plenty. Human tularemia case at Libertyville. |
| | | 1925-6 | Very short-only 1/8 of normal crop. |
| Joe Nadelhoffer | Lake | | "About same every year. Hole up after Nov. 10." |
| John M. Olin | Madison | | "No great variation between years." |

bedding out, was determined for Illinois and checks very satisfactorily with the line determined for Iowa. The location of this line is shown on Map C. The significance of this line is that to the north of it rabbits are able to survive with less winter cover than to the south of it.

## 14. Miscellaneous Species

Map N shows the distribution of ruffed grouse, deer, and turkey and gives the dates on which these species were exterminated from various areas.

Ruffed Grouse. It is rather puzzling why this species should have disappeared from the northern counties when it still persists in the broken lands adjacent to the Mississippi and Illinois Rivers.

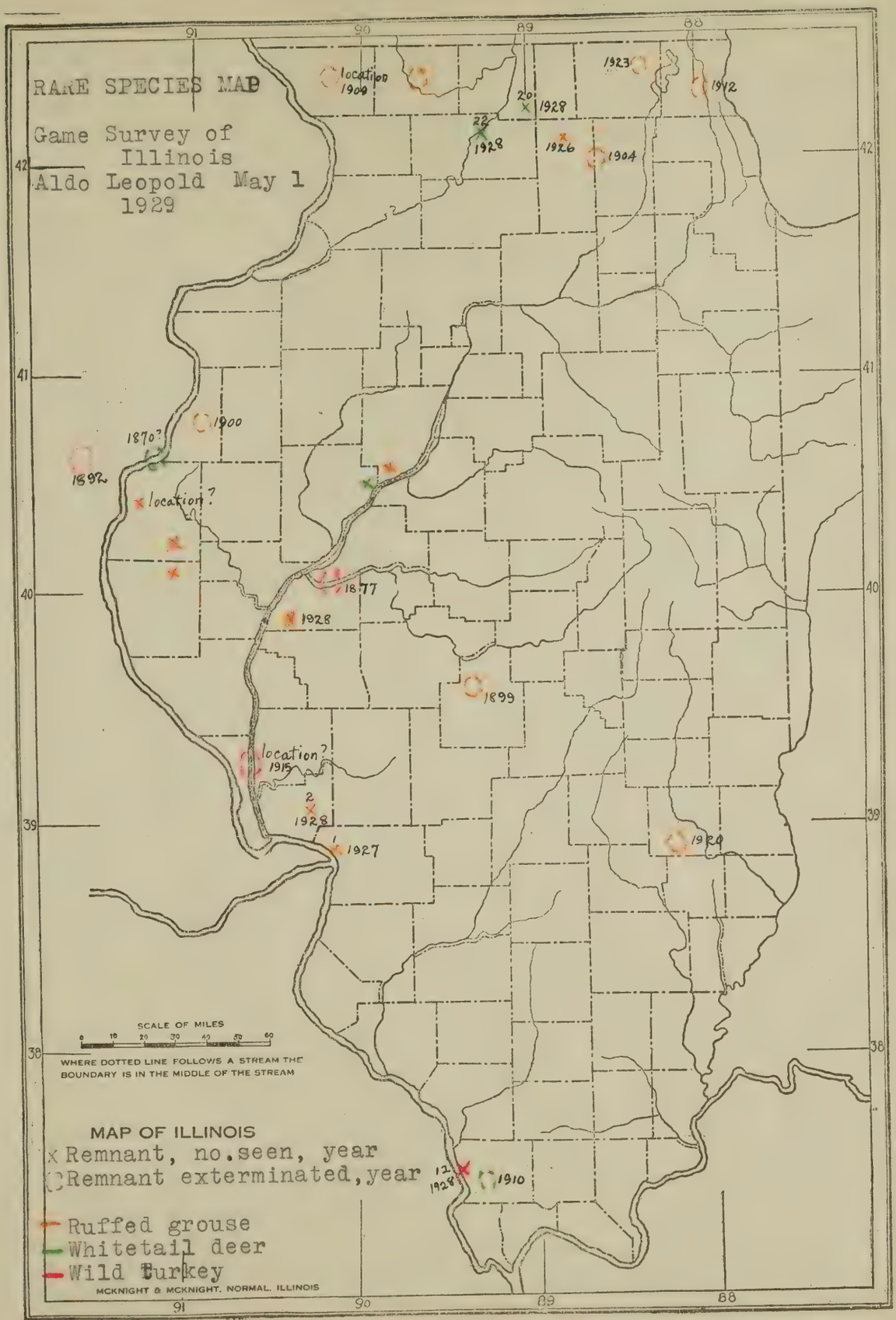
Nelson (1877) reports the species as a common resident near Chicago. George W. Walke (1897) reports it rare in Boone County. Woodruff (1907) reports "still occasionally met with in Lake County, Indiana," indicating its disappearance from the Chicago area by that time. This coincides with my findings.

Ridgeway (1895) says "found throughout the state- - -becoming more rare southward- - -uncommon in the vicinity of Mount Carmel and growing less as the woods become clear."

Ridgeway (1874) also states that this species is resident in the entire state. I was unable to find anybody, however, who recollected its presence in the Ozark Ridge country of southern Illinois except Huff, who stated that it was plentiful in the Ozark Ridge but is now gone. Karraker, however, who has lived in the Ozark Ridge all his life and is a keen hunter, did not know that the species had ever occurred there.

Nobody familiar with the present remnants of grouse could remember any particular fluctuation in their numbers. It would appear that in Illinois, like Ohio, the isolated remnants of ruffed grouse are not subject to the periodic diseases or other causes of destruction which overtake them on their main range.

Map N


RARE SPECIES MAP
Game Survey of
Illinois
Aldo Leopold May 1
1929
location
1909
1923
1912
20
1928
22
1928
1926
1904
1900
1870?
1892
location?
1877
1928
1899
location?
1915
2
1928
1
1927
1929
12
1928
1910
SCALE OF MILES
0 10 20 30 40 50 60
WHERE DOTTED LINE FOLLOWS A STREAM THE BOUNDARY IS IN THE MIDDLE OF THE STREAM
MAP OF ILLINOIS
x Remnant, no. seen, year
( Remnant exterminated, year
Ruffed grouse
Whitetail deer
Wild Turkey
MCKNIGHT & MCKNIGHT, NORMAL, ILLINOIS
91
90
89
88
42
41
40
39
38

Wild Turkey. Nelson (1877) reports the wild turkey "still abundant in southern Illinois and in bottom lands along rivers in central Illinois."

Ridgeway (1895) says "weights 16 to 40 pounds in extreme southern counties. Still common but becoming less so even here."

Woodruff (1907) says "fairly common in the densely wooded districts in the central portion of Illinois."

G. W. Walker (1897) says "extinct in Boone County since 1845."

Musselman (1922) reports " a few supposed to be in the heavy river bottom woods in southern Illinois."

Lashbrook told me that turkey disappeared from the Sangamon bottoms in 1877. Olin told me that turkey disappeared from the mouth of the Illinois 15 years ago, or about 1915. My father killed a wild turkey about 1892, probably near Farmington, Iowa, on the Skunk River across from Hancock County. This was the last flock in that region.

Evidently the wild turkey disappeared from nothern Illinois about 1850, from the central portion about 1880, and from the southern extremity in more recent years. A single flock still persisted in Union County in 1928. This consisted of 12 birds, using both on the Illinois bluffs and across the river in Missouri.

The extreme persistence shown by this species wherever suitable timber cover remains is good evidence for believing that it could be brought back in considerable numbers if the state ever embarks on a state forestry program. It would seem especially important for the state to save the single remnant probably remaining in Union County, since these birds may represent native blood impossible of replacement through the importation of breeding stock.

Neither the acquisition of state forests and other kind of land

acquisition, however, can hope for large public support until the state conservation department has been re-organized along more stable and more technical lines.

Deer. Karraker says that wild deer of native stock did not disappear from Union County until about 1910. I recollect a statement made by Edward Runge that he had killed the last deer on Big Island, opposite the north-western corner of Hancock County, and as nearly as I can calculate this must have been about in the 1860s or 70s.

The 3 herds now existing in the state all represent escapes from captivity. The herd on the Illinois River near Urbana escaped about 20 years ago and have now increased from 15 to 30 head, according to Baker. The 2 herds near Rockford numbering, according to Rowan, 20 and 22 head respectively, represent escapes from an abandoned deer farm.

There seems to be little hope of the re-establishment of deer in a wild state except possibly in connection with state forests in southern Illinois.

Squirrels. Musselman told me that several fox squirrels were found dead on the ground in the neighborhood of Quincy. He suspects disease, possibly tularemia, although no human cases have occurred in that vicinity.

Fox squirrels are fiarly common wherever sufficient timber persists. Gray squirrels are found only in the remnants of thick brushy woods.

Doves. Illinois lies just on the eastern edge of the territory in whihh doves are of sufficient abundance to furnish shooting. In the Lake section several reports were heard that the birds were too scarce to warrant an open season.

## 15. Predators.

Cats. Two observers report having found cats denning and having young away from buildings. These cases are important in throwing light on the degree to which cats actually revert to a feral state.

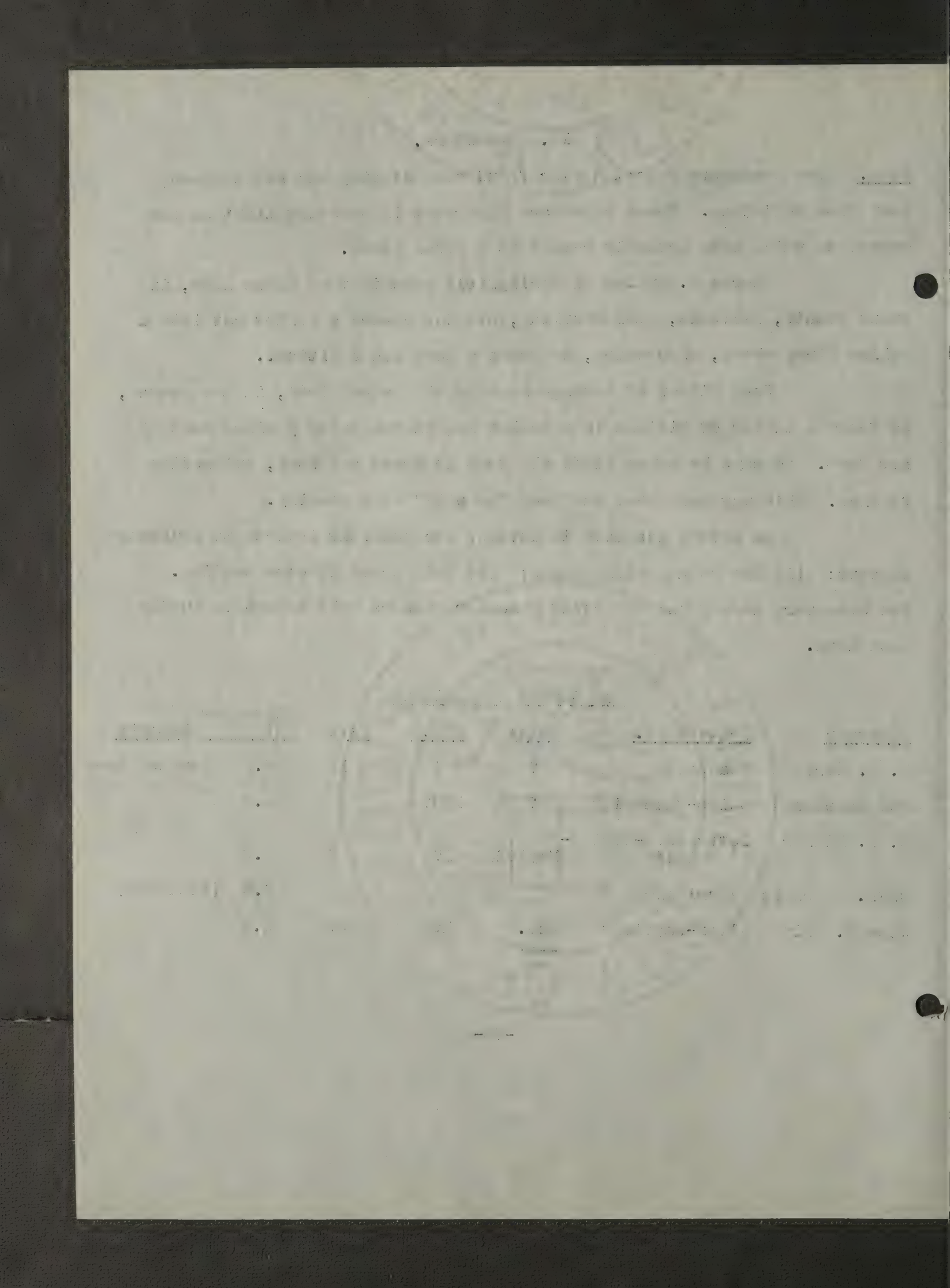
George A. Dunlap of Springfield reports that about 1900, in Brown County, Illinois, near Sterling, his dog chased a yellow cat into a hollow stump where, on opening, he found a nest and 3 kittens.

Jack Wilson of Marengo reports that about 1924, in the summer, he found a litter of kittens in a hollow log in the woods ½ miles west of his farm. He says he often finds old toms in trees and logs, but seldom females. This may mean that the toms "go wild" more readily.

An effort was made to develop two possible indices to abundance of cats: (1) Eye counts along roads; (2) Cats treed in coon hunting. Few observers were found who could remember numbers well enough to supply good data.

Cat Counts in Illinois

| Observer | Route & Co. | Dates | Miles | Cats | Miles Per Cut | Remarks |
|---|---|---|---|---|---|---|
| H. B. Ward | Champaign | ? | 4 | 12 | 0.3 | Counted eyes |
| Gus Radebaugh | Cairo-Champaign | ? | 150? | | 3.0 | |
| R. B. Miller | Petersburg-Springfield | May1928 | 17 | 6 | 3.0 | |
| Chas. A Sparks | Vermillion | | | | 2.0 | (Estimate) |
| John M. Olin | Alton-Fayville | Dec. 1927 | 100 | 39 | 2.5 | |



Cats in Coon Hunting

| Name | County | Date | No Dogs | Cats Treed | Coons | Remarks |
|---|---|---|---|---|---|---|
| S. A. Offield | Sangamon | ? | ? | 4 | 0 | Cat weighed 14 lbs. |
| Geo. A. Dunlap | " | Average per evening | | 1 | | |
| | | Max. " " | | 3 | | |
| Ed. Karraker | Union | | | 0 | | Never treed one |
| Jack Wilson | McHenry | Average per evening | | 2 | | |

Karracker's observation that he had never treed a cat in coon hunting is significant because this is a region in which there are some wild bobcats. It bears on the hypothesis, advanced in the Mississippi report, that bobcats may prey on housecats or their young.

Foxes. Are protected by law all but 45 days. There is an active fox hunters association in the southern part of the state, which holds an annual meet at Ramsay.

Both reds and grays occur in southern Illinois. Probably grays occur in Jo Daviess County. There ar a few grays near Freeport, Otherwise in so far as known, the red fox is the prevalent species.

There is no exact information on the importance of foxes even in Georgia, where they are too rare to be a factor in quail. It is important to find out the extent of their depredations on quail.

Crows. Forbes and Gross in August-October, 1906, found that there were 41 crows per square mile between Danville and Quincy, and that they constituted 7.1% of all birds (as compared with 1.4% for quail). As remarked under quail, however, the greater visibility of the crow may have distorted this proportion.

A few crow roosts are shown on Map C. This is a very incomplete record.

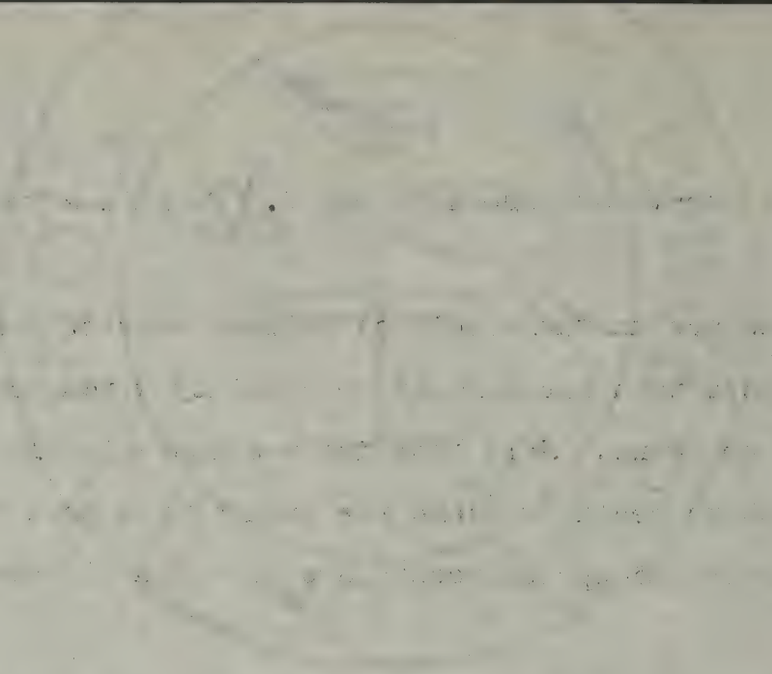
Crow roosts are unstable both as between seasons and years. Musselman (1922) reports a large roost near Quincy which has been dwindling since and is now gone. This roosting was done in elm trees right in town. In the northern sections where the bulk of the crow population migrates, fall roosts and spring roosts are often in different locations.

Wildcats (Bobcats) still occur in Union County and one was found last winter in DeKalb County near Genoa.

Fur Bearers An otter was taken near Meredosia about 1926; there area few in Union County. In some unaccountable way a pair of beaver appeared near Meredosia in 1926. They have since disappeared. There is an extraordinary number of mink on some of the prairie streams of Champaign County.

Trapping is prohibited by law on the petition refuges legalized by the state on private lands. When this law is enforced it naturally makes trouble. Thus skunks are said to be excessively abundant on the so-called State Game Preserve near Sycamore in DeKalb County.

General. Not much can be said about predators in Illinois because not much is known. A quantitative study of their effect on quail, pheasant, ducks, and turkey is badly needed.



(B) Land Practice & Shooting Privileges in Illinois.

16. Summary. Practically all dependable waterfowl lands and most accessible quail lands are closed to public shooting. Very little, outside of baiting of duck lands, is being done to make posted lands actually productive of game. Duck lands have acquired a high value (up to $250 per acre--see Waterfowl) by reason of their scarcity, but few or no Illinois lands have been given an additional value by reason of enhancing their productivity. This fact lies near the heart of the Illinois game problem. There can be little satisfaction in soaring prices or bags which result merely from the accident of geographic location and the practice of artificial baiting.

Somehow both the landowner and the sportsman must acquire a totally new point of view toward the land problem.

The vital question is how to bring this about. There is no need to repeat the suggestions already developed in the reports for other states. One new idea, however, was encountered, which may be of significance in Illinois and elsewhere.

17. Clayton Berry Quail Preserve. Clayton Berry is a young farmer owning a farm 1½ miles east of Exeter in Scott County. He leases the shooting on all surrounding farms--possibly 1,000 acres in all-- and then subleases to Chicago sportsmen, for whose behavior he is responsible to the owners of the land. Incidentally, he furnishes dogs if desired, and manages the coon and fox hunting as well as quail hunting. A letter of inquiry was sent him as to details, but no reply was received.

The Berry enterprise is significant in that it seems to meet the two weak points in the present drift of events:

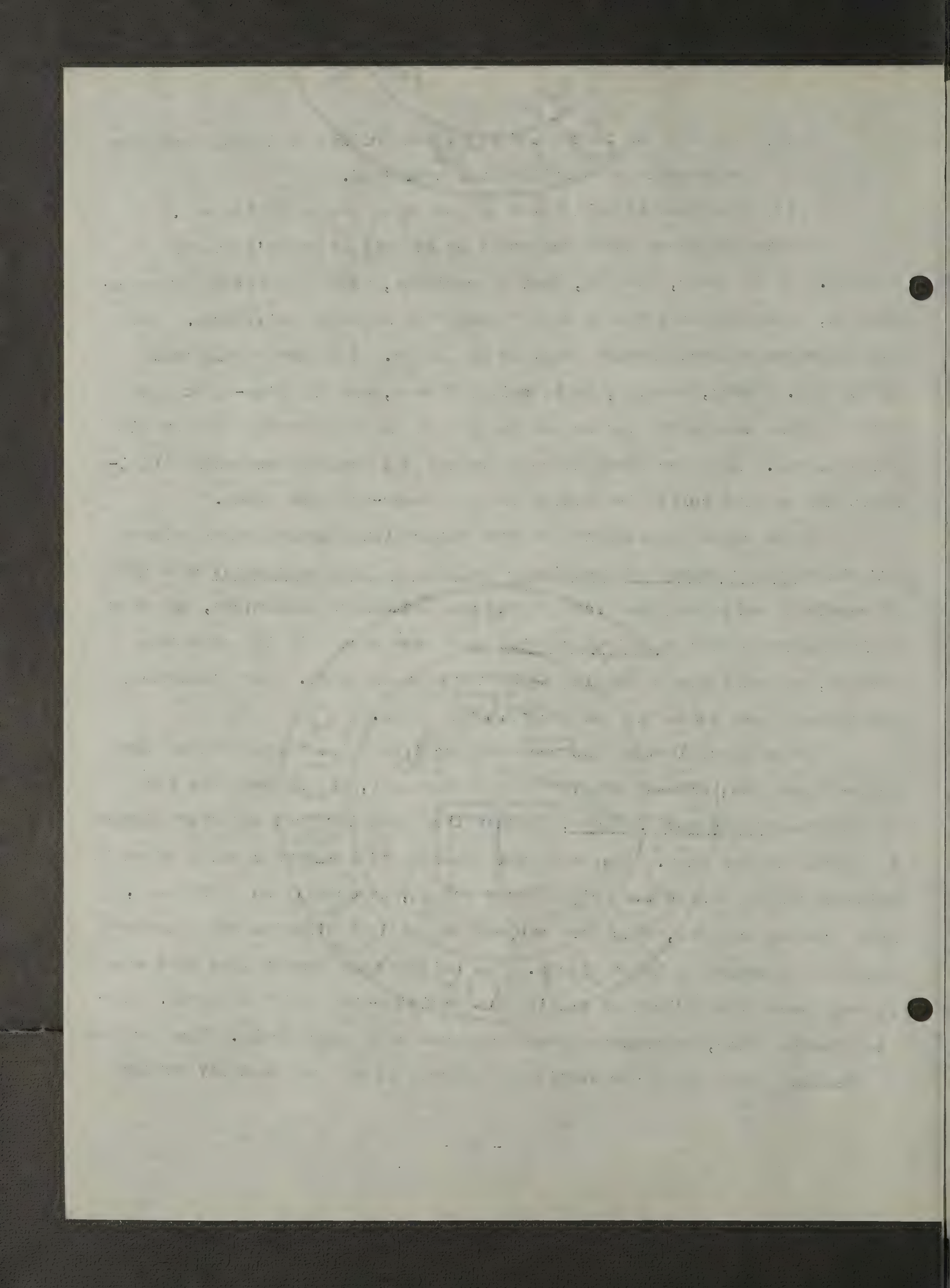
(1) the lack of farmer and sportsman initiative in starting game management on specific tracts of land.

(2) The need of collective action among groups of farmers.

Nothing is known about the merit or demerit of Berry's actual methods. It is clear, however, that he could be, under his scheme of organization, something more than a mere "broker" of shooting privileges. Many such absentee brokers already exist in the South. They are mostly real estate men. Berry, however, is himself a farmer, and his line-up is such that he could become the leader and manager of the game enterprise for his neighborhood. In other words he could become the means of awakening initiative and getting collective action in his farmer-sportman group.

If we could now conceive of some enterprising agricultural college offering a short course of vocational training in game management to a group of carefully selected young farmers who are themselves landowners, and then following it up with technical service by a game expert in its extension service, we would have a working mechanism of real merit. Its workability has already been tested in the agricultural field.

It is possible that the proposed vocational instruction under the Smith-Hughes Law, already proposed for Mississippi, should take the form of training neighborhood leaders, rather than training each and every farmer to manage his own game. The best quail country will always consist of small units requiring collective neighborhood action, especially in activities, like predator control, which are subject to marginal dilution and therefore conducted cheapest on large blocks. The neighborhood leader idea also completely meets the objections arising out of inter-farm drift of birds. Winter feeding, too, is cheapest when organized on a large scale. The purchase of planting stock for re-vegetation of coverts is another activity better



adapted to neighborhood than to individual initiative. Posting and policing is obviously easier for a large area than a small one. Techincal service can be rendered better to a group than an individual.

The proposed vocational training need not all be given in one lump. If the agricultural college has a demonstration area (organized under the present system of fellowships) the neighborhood leaders could be invited to come in at any time to see the results of some new experiment of consider some new idea. There would be an excellent chance to gradually build up in these neighborhood leaders a certain breadth of view, a certain ethical standard, and a sound attitude toward biological problems now too often lacking in managers of shooting right not only in this country, but also in Europe.

In states or parts of states where game farming is important these neighborhood leaders might also be offered special instruction at the Clinto school.

The general principle here proposed would work for any kind of game, but quail is the obvious choice for making a start.

The men trained un Institute fellowships would fall naturally into the role of technical advisors in the extension service, travelling from one neighborhood group to another and helping solve their special problems. Obviously these neighborhood groups would offer valuable proving grounds for testing the workability of conclusions reached through research.

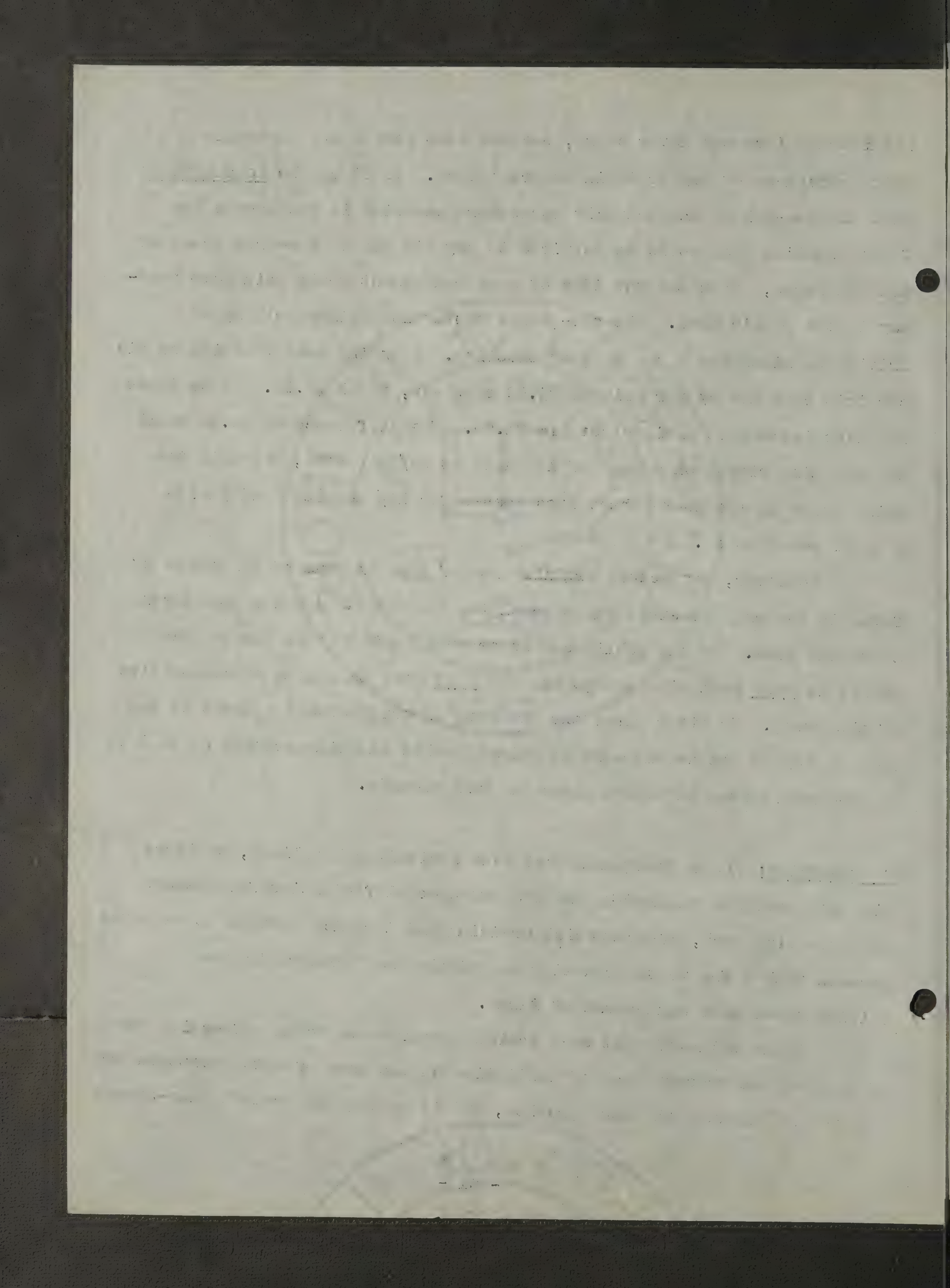
It strikes me that concrete constructive projects proving that an abundance of game can be raised on posted farms actually put under management are a much more effective means of combating the almost universal prejudice against paid shooting, than are abstract arguments to the effect that farms must be posted if we are to conserve any game. The argument in

its abstract form may never carry, because most people are incapable of being convinced of any truth in abstract form. If it can be demonstrated that the one-gallus man actually burns more gasoline in the search for freee shooting than would be required to pay his fee on a nearby group of managed farms, then the new idea of game management would gain some headway in the public mind. The one-gallus hunter now thinks nothing of driving 50 miles for a day of poor shooting. Counting deterioration on his car this cost him 8¢ per mile or $4.00 each way, total $8.00. If he drove 10 miles instead it would clost him $1.60. The difference of $6.40 would buy shooting rights on a bag of 13 quail at 50¢ per head, which is the going price in the South where land leases for 15¢ per acre and yields a quail per 3 acres.

Moreover, the actual organization of game management on groups of farms is the only possible way of applying the public shooting grounds idea to upland game. If the public can lease such lands for the use of the public it must deal with groups and it must deal through a representative of the group. In other words the training of neighborhood leaders is the logical key to the development of upland public shooting grounds as well as to the development of upland clubs or toll grounds.

To summarize; It is prorposed that some agricultural college, equipped with an Institute Fellowship and its own special facilities for research and extension work, offer special training and technical service to selected farmers with a view to their acting as neighborhood leaders in the initiation of game management of farms.

It is believed that such action promises to be an effective way of meeting the present lack of initiative on the part of both sportsmen and farmers in solving the land problem, and in making the present wide-spread



demand for "more Game" actually effective by creating a corresponding supply.

It is believed that such action is the logical key to upland public shooting grounds as well as upland clubs and toll grounds.

It is believed that such action is more likely to avoid the undesirable characteristics of European game management, than if private management were to start unguided by technical advice from public institutions.

18. Posting & Charging. The following data were gathered on present conditions, in addition to those already presented under "waterfowl":

| Observer | Address | Territory | %Farms Posted | Remarks |
|---|---|---|---|---|
| D.R.Abernathy | Lawrenceville | Lawrence Co. | 90% | No charging as yet. |
| C.F.Huff | Danville | Vermillion Co. | 50% | Beginning to lease. ($15 per day incl board & dogs) |
| Geo. Luthy | Peoria | Peoria Co. | 80% | No clubs or leasing |
| Frederic Leopold | Burlington | Henderson Co. | | Almost all quail lands posted. |
| V. G. Musselman | Quincy | Adams Co. | 60% | No clubs or charging |
| Kenneth Knowlton | Freeport | Stephenson Co. | 50% | No clubs or charging Must ask permission in all cases. |
| Jack Wilson | Marengo | Near Marengo | | Nearly all posted |
| Warren Rowan | Belvidere | Boone Co. | 50% | No charging, but some farmers take "tips". |
| Guy Wakeley | Harvard | McHenry Co. | | Farmers get $15 per day per man for goose shooting. |

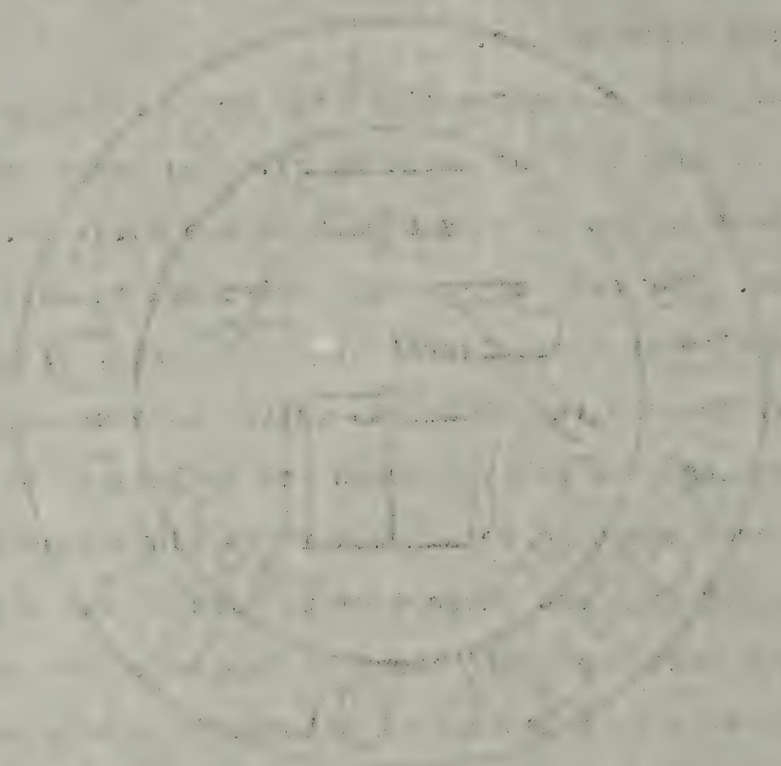
The Osage Hedge. One of the major events of game conservation history in Illinois has been the progressive tearing out of the Osage orange hedges widely planted by farmers in the days when land and labor was cheap and cash for fencewire scarce. Agricultural authorities have advised their removal on the grounds of land used, harborage for insects, harborage for San Jose Scale, and cost of maintenance. The gas tractor has of late made it easy to comply with their advice.

All of these charges against the osage hedge are of course true, yet I doubt if they are the whole story. The hedge may have been condemned on a hasty examination of only a part of the evidence. Much depends on the point of view. Why are hedges still universal in England where land is much scarcer? In view of agricultural overproduction, is it really a benefit to the community and the individual to insist on every square yard producing crops? As against the debit represented by land-waste and harborage for pests, what credit should be allowed for windbreak service, post supply, and harborage of game and insectivorous birds? Has anybody ever tried to make the osage hedge more efficient by improving the original placement of the stems and devising a mechanical trimmer to reduce labor costs?

Lodge told me his hedges cost 10¢ per rod for 2 trimmings per year. He figures a hedge wastes a rod wide strip of soil.

Dunlap told me the champion Harvester Co. once put out a hedge trimmer with a cutter-bar 3'-6' long which performed the vertical trimming successfully. It did not do the horizontal trimming on top, which had to be performed by hand. Doubtless a practical machine to do all the trimming could be devised.

Lodge showed me a hedge "woven" years ago by a specialist which has been kept trimmed and which today presents a nearly pig-tight fence. It



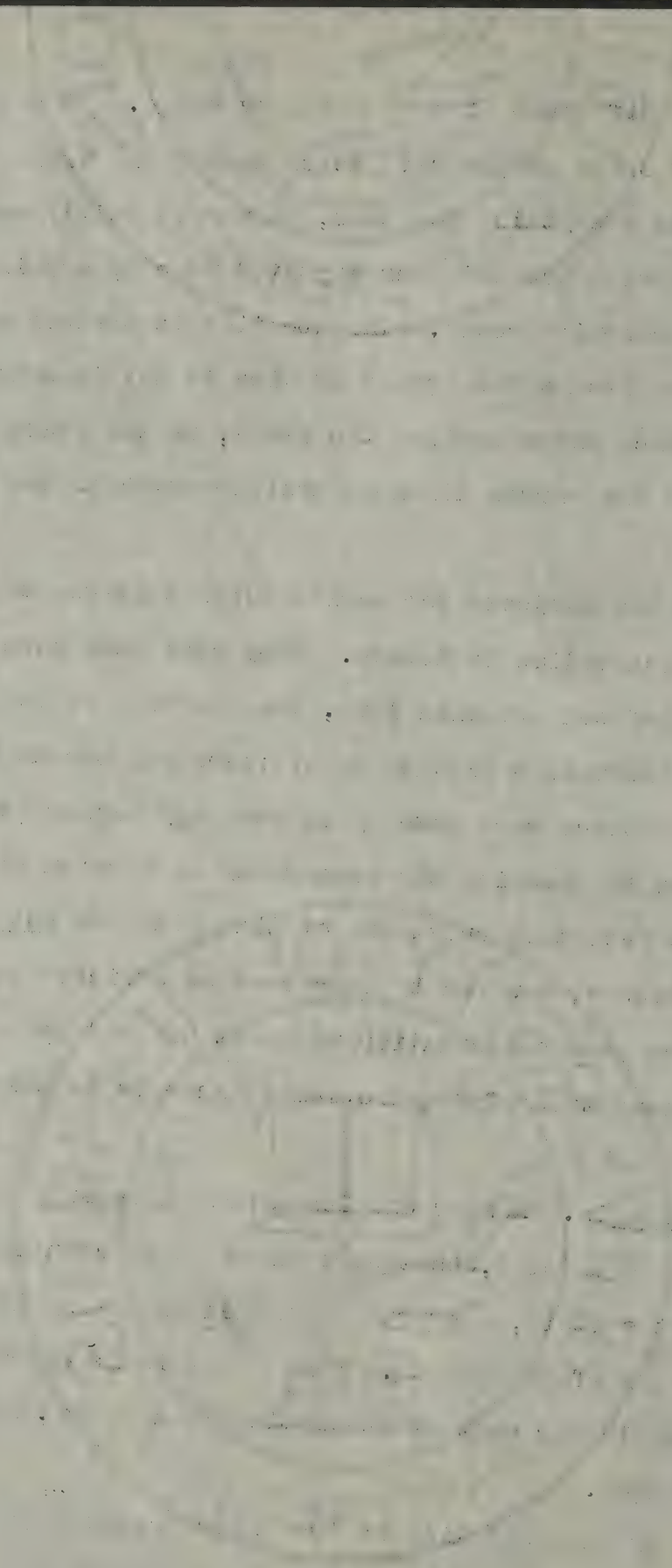
looks entirely different from an ordinary hedge. It suggests that the good points of osage hedges have never been fully exploited.

Putting everything together, it may be fairly asked whether the anti-osage campaign has not been dictated more by a point of view than by immutable economic trends. The question is whether a re-examination of the evidence from a new point of view is not in order? Even if the economic evidence shows against the hedge, is the state really prepared to "live with" the barren lifeless prairie which is the inevitable consequence?

These are subjects for agricultural colleges to investigate and for conservation bodies to debate. They have much more significance than the tinkering of conservation laws, the starting of game farms, and the signing of conservation pledges by citizens who own no land. The general public would produce more game by in some way paying the farmer a bonus on hedges than by spending the same money on foreign birds or Kansas rabbits. The fact that questions of this kind are not discussed by conservation bodies or studied by conservation officers is conclusive evidence that the game conservation movement has not yet come to grips with the real fundamentals of the problem it intends to solve.

Erosin in Illinois. Mosier and Gustafson(University of Illinois, 1928) show than an area of 5,365 square miles in 62 counties surveyed, or 15 per cent of the state, consists of broken and hilly land subject to serious drainage from surface washing. Some of this is already completely ruined. An additional 15 per cent of undulating land is not badly damaged yet, but is in danger.

All of this 30% lies in the river breaks type, which is the



cream of the quail country. Since this type, including bottoms, comprised 42 per cent of the state, it is fair to conclude that the states own agricultural authorities, after a detailed soil survey, have pronounced the river breaks in serious danger of permanent deterioration.

What should be done?

At this point it should be pointed out that erosion control is more than a matter of stopping gullies. It is first of all a matter of conserving organic matter on every square foot of every field through proper rotation of crops. No amount of gully-stopping can save a field depleted of its fertility.

However, it is equally true that depletion of soils is an accomplished fact on millions of acres, and that the prevention of the steepened gradients introduced in any field by any gully is a necessary supplement to conservative cropping as a means of reclamation. Revegetation of drainage channels is the cheapest means of checking gullies if they are there or preventing them if they are not there.

Such re-vegetation is good agricultural engineering even if there were no possible income from game, or crop-benefit from game and other birds which such re-vegetation brings with it. When the benefit from birds is added, revegetation becomes good land-use.

Incidentally re-vegetation of drainage channels introduces exactly that interspersion of environmental types which is essential to optimum yields of "short-radius" game like quail. Most song and insectivorous birds have an even shorter radius of daily travel during their breeding season (see Howard, "Territory in Birds").

The drainage channels in need of re-vegetation are literally the "warp and woof" of Illinois. If Map A could be drawn on a huge scale, or

if one looked down on the state from an airplane, this would be strikingly apparent.

It is admitted that the best plants for re-vegetation and the best ways to plant and maintain them are not known, and should be made the subject of careful research. It is claimed that enough is already known, however, and enough can be inferred by ordinary common sense, to call for a substantial reversal of the prevalent attitude of agricultural colleges toward the general subject of cover on farms. The prairie states are increasingly bare of drainage-channel cover partly because the agricultural authorities have advocated, or at least acquiesced in, that tendency to remove all cover which carried its momentum from the necessary clearings of the pioneers.

That this momentum has carried the state too far is attested by the Mosier and Gustafson bulletin.

There is no economic issue of greater fundamental importance to a state like Illinois than the conservation of its soil, and there is no practical means to this end of greater promise than the maintenance of game coverts on drainage channels.

## (C) The Conservation Public in Illinois

19. The Basic Issue. Illinois differs from any other state so far surveyed in that there is no organized effort to effect any basic improvement in state leadership in conservation affairs. As in other states, that leadership is recognized as deficient due to political influences. Unlike other states, these deficiencies are regarded as incurable.

This public attitude is extremely important and extremely discouraging. It is unthinkable that certain kinds of game, like quail and pheasants, can be successfully conserved without any particular help from the state (see Section D, for example). It is hardly conceivable, however, that prairie chicken, ruffed grouse, wild turkey, or waterfowl can get along without an aggressive and skillful program of state forests and state game refuges. Such a program hinges basically on public confidence in the state conservation department. Without that confidence the necessary funds and powers are not likely to be granted.

It seems needless to say that this criticism of Illinois is not a criticism of any particular individual or group. It is necessary, however, for such a survey as this to call attention to what seems to me to be a basic defect of the Illinois conservation movement. Illinois conservationists can rebuild the conservation department if they want to badly enough, and if they can develop the right kind of leaders for the purpose.

20. Conservation Organizations. The principal organization is the Izaak Walton League, and in the south, the Southern Illinois Sportsmen's Association. No data on the strength or distribution of these organizations was gathered. Figures are largely meaningless in appraising their potentialities.

I encountered small country chapters of the League, for instance, which seemed to have all kinds of vitality and were actually wrestling with their local problems, while many large chapters were either sidetracked into functioning as social clubs or else were practically dead. These inert units may be the result, not the cause, of the absence of any attempt to reorganize state leadership.

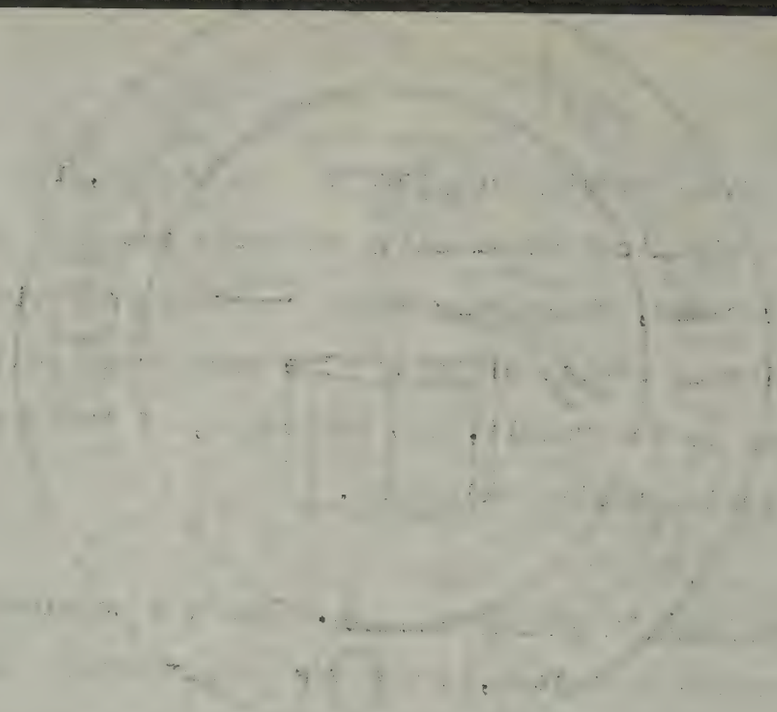
21. Farm Organizations and Farm Press. While a considerable number of individual farmers were seen, there was unfortunately insufficient time to contact with their organizations. These include the Illinois Farm Bureau, the Illinois Agricultural Association (608 S. Dearborn), and the Illinois Farm Guards.

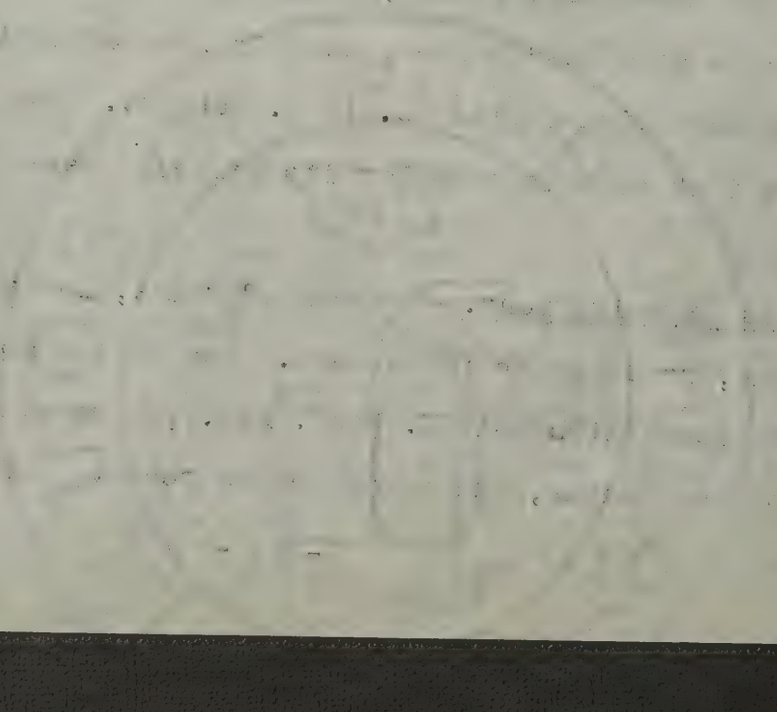
Chicago is the centre for the farm press of the prairie states. One of these papers--The Prairie Farmer--was visited on a previous occasion, and takes an enlightened and sympathetic attitude toward game problems.

There is possibly no particular occasion for going to these farm agencies with the game problem in its abstract form. When concrete information is available (such as would be developed through research under a fellowship), or when a concrete move is under way (such as that proposed in Caption 17) these papers will, I think, co-operate.

Chicago also headquarters certain farm educational ventures such as the Atlas Educational Film Co. (5 N. Wabash). Two attempts were made to interview this organization but its officers were out.

22. National Organizations. Several of these, in addition to the Izaak Walton League, headquarter in Chicago. One of the most significant is the Izaak Walton Foundation (410 N. Mich. Ave.), a chartered corporation independent of the League, and organized to receive and administer funds for





the promotion of conservation education and research.

The Conservation Club of America (332 S. Mich. Ave.,) started as an effort to pool high-class club privileges in various regions. It is now headed toward a broader program not yet exactly defined..

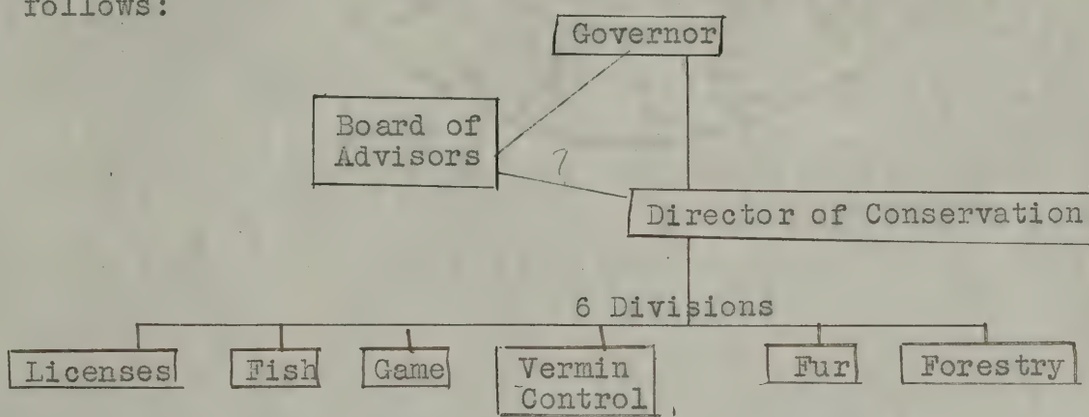
23. Sporting Press. In addition to Outdoor America, the organ of the Izaak Walton League, the American Field Publishing Co. (440 S. Dearborn) headquarters in Chicago. I regret that no contact has as yet been made here, since this is one of the oldest of the sporting publications, all of which must play a part in the development of a game restoration program.

This brief inventory of public leadership for game restoration in Illinois makes no pretense of being complete. Chicago alone doubtless contains numerous and important state and national bodies vitally interested in the subject.

## (D) Game Administration in Illinois

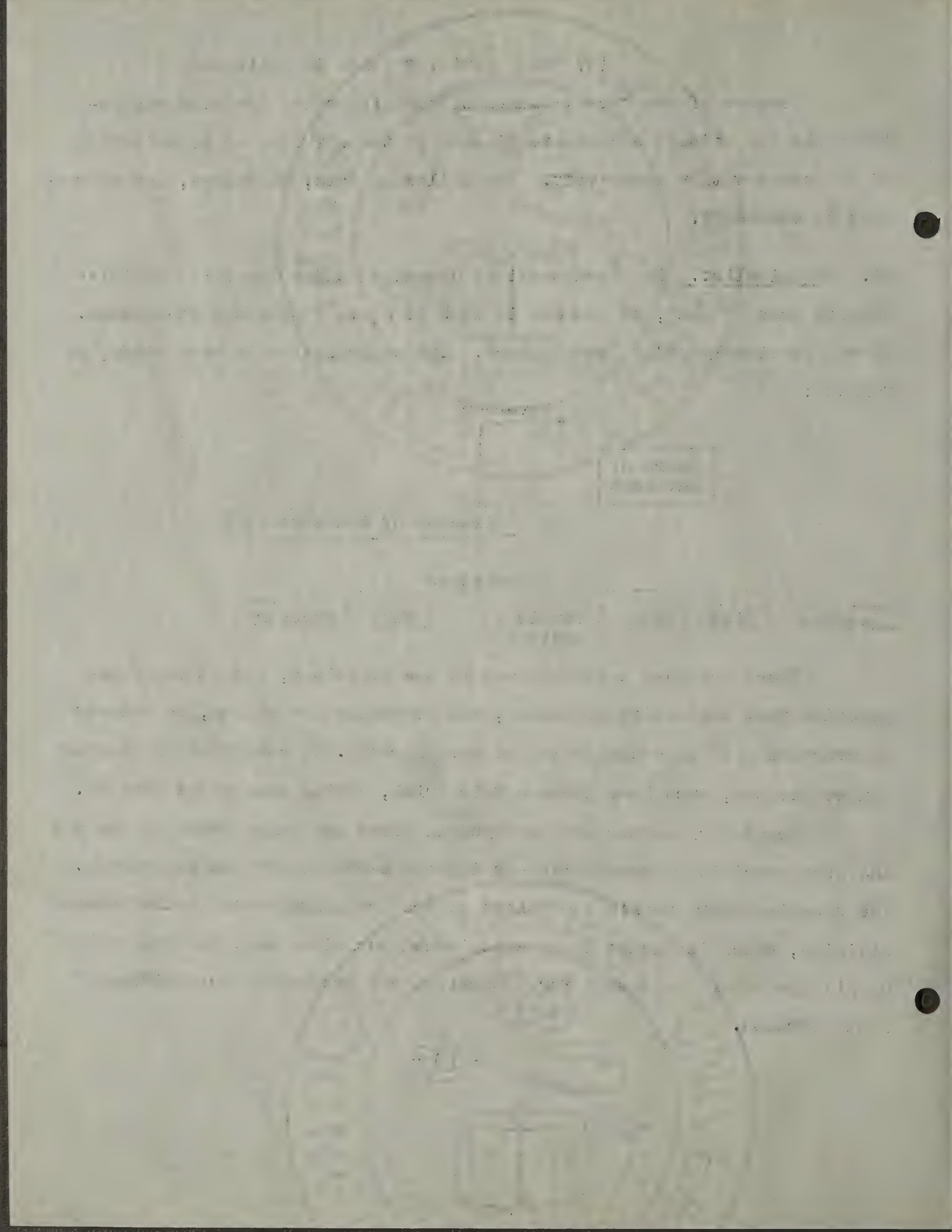
Because of the recent change of administration the time was unfavorable for gaining a complete picture of the workings or organization of the conservation department. The following data, therefore, may be subject to amendment.

24. Organization. The department is organized under the Civil Administration Code of 1917, as amended in 1925 to create a separate department. It was previously under agriculture. The organization is very simple, as follows:




There are some technical men in the Divisions, but it is my impression that the entire personnel, and certainly the policy, is subject to overturn with each change in the governorship. No conservation program can be started, much less given a fair trial, during such short periods.

Regulatory powers are conveyed in broad and vague terms by the act, and such specific powers as land-buying are exercised by the department. The unsatisfactory workings of these powers are illustrated in the forestry division, which is headed by an experienced technical man, who has worked up all the detail necessary for embarking on a program of acquisition of state forests,



including actual options on suitable lands. Yet no acquisitions have ever been made. There is no mandate in the law to build a system of state forests, merely an authorization "to take such measures for the promotion of forestry--as may be" prescribed by law.

On the other hand there has been rather free acquisition of a miscellaneous scattering of parcels of land, most of which are not suited to carrying out any particular objective or purpose, and which are variously labelled as "refuges," etc. (See Map O, takem from the Department's Report for 1928).

The useful exercise of any regulatory powers, or the execution of any conservation policy, require technical leadership and continuity of action. Both are almost impossible under Illinois organization.

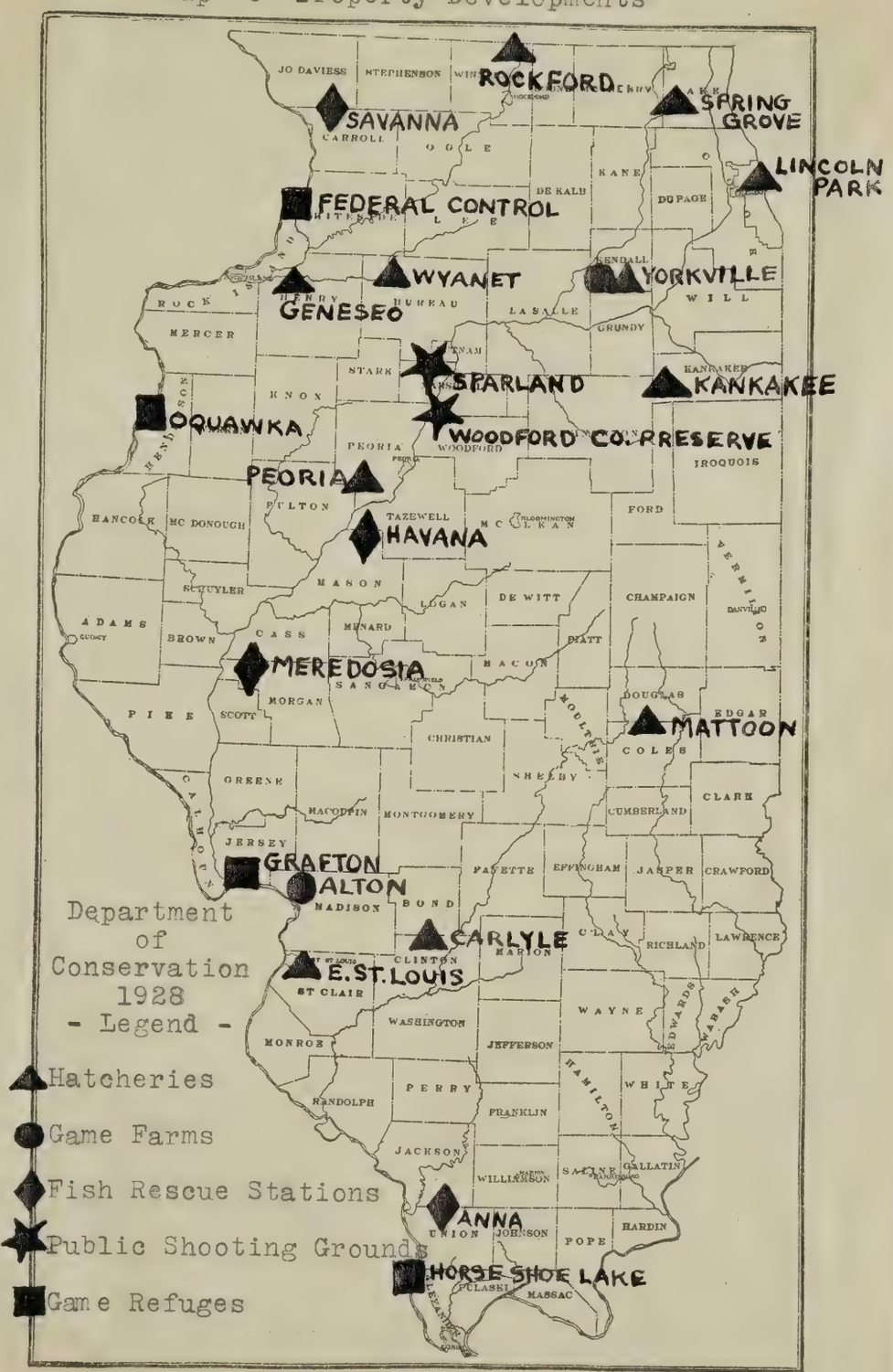
What is worse needed is the interposition of an unpaid board between the Director and the Governor, with staggered terms to avoid sudden overturns. If highgrade citizen-conservationists could be obtained to comprise such a board, and if it were given entire responsibility, including the appointment of paid executives and the exercise of regulatory powers, it could lay down policies and hire men competent to carry them out.

25. Finance. Table P, taken from the Department's 1928 report, gives a summary of receipts and expenditures for the last 4 years.

26. Properties. In addition to the owned refuges shown on Map O, the state leases 30 refuges aggregating 10,000 acres from farmers. This is under Sec. 46 of the Game Code. The status of management on these "preserves" is indicated by the fact that the law prohibits predator control on them (See Caption 15).

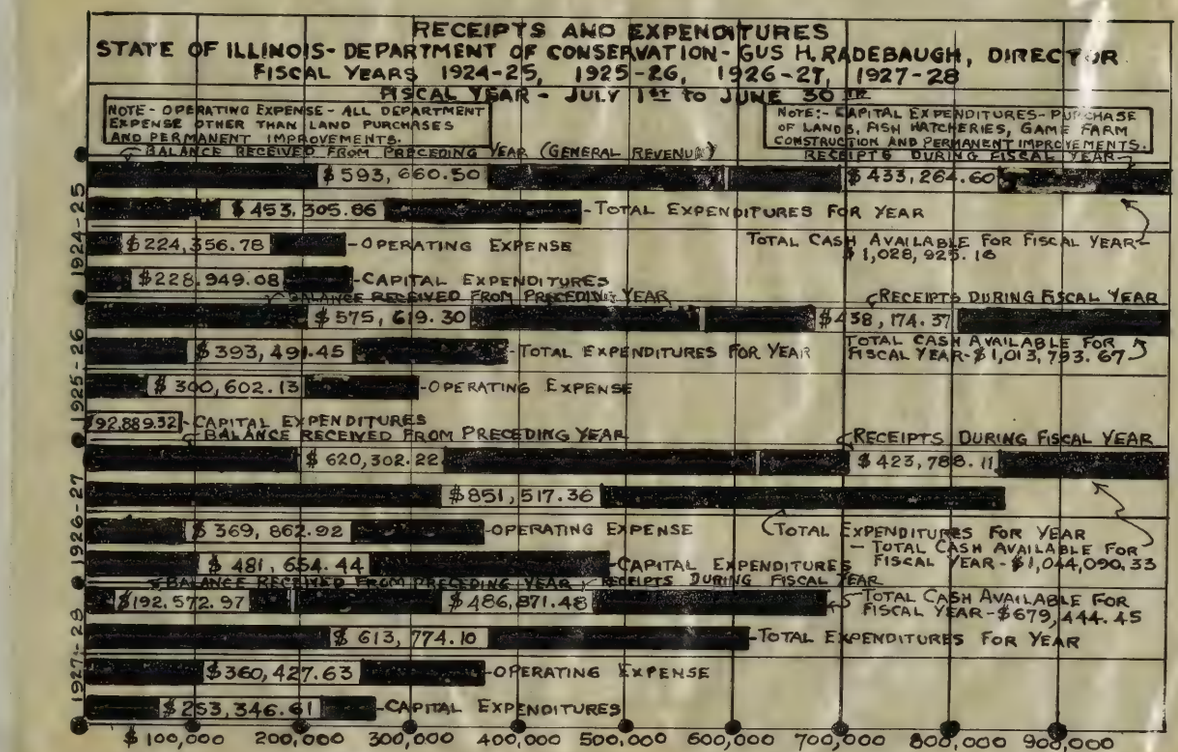
It has already been pointed out that one of the owned refuges, Horseshoe Lake, is a decided success.

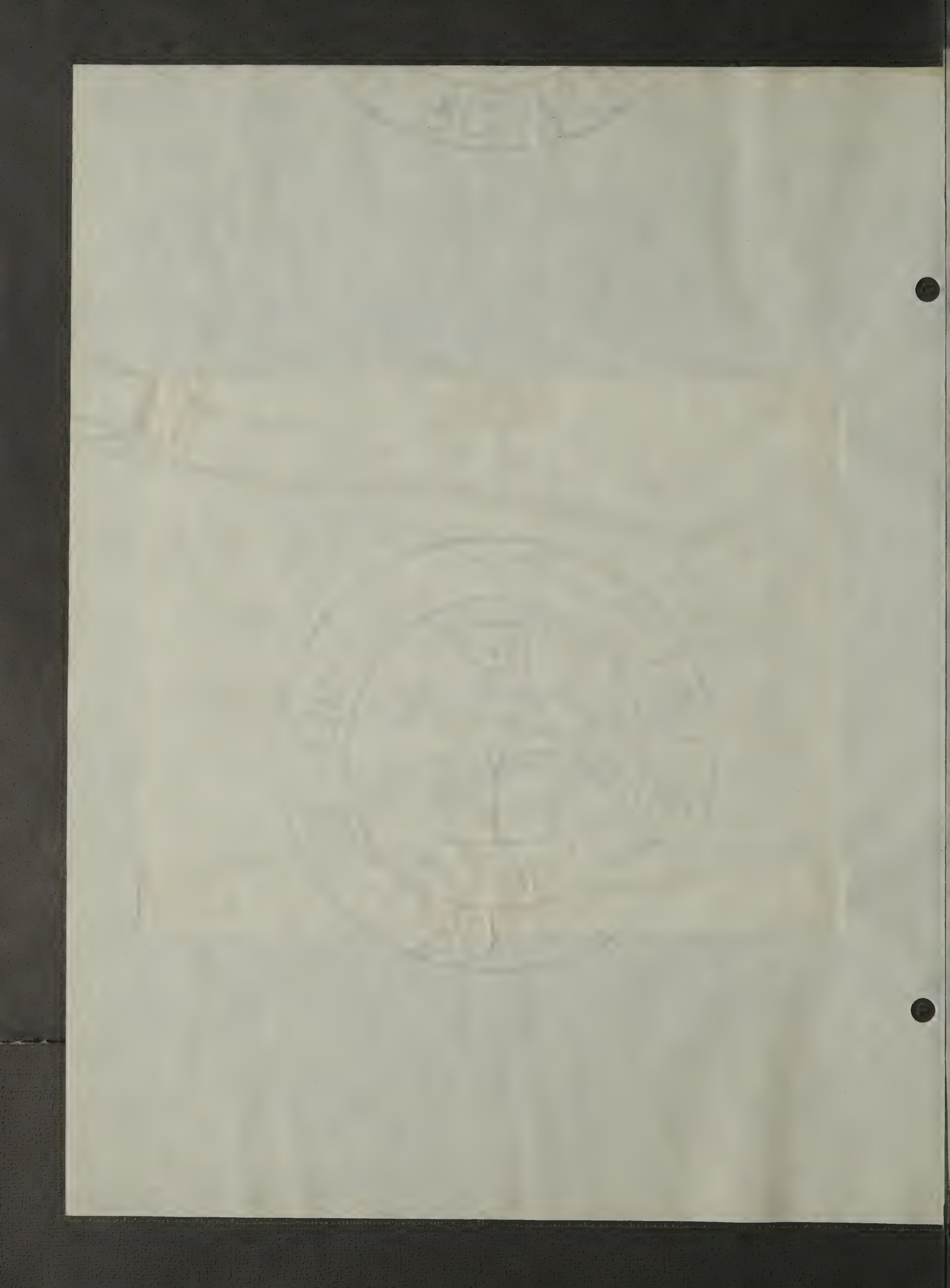
Map O Property Developments




(35308—5M—7-25)

Table P


RECEIPTS AND EXPENDITURES
STATE OF ILLINOIS - DEPARTMENT OF CONSERVATION - GUS H. RADEBAUGH, DIRECTOR
FISCAL YEARS 1924-25, 1925-26, 1926-27, 1927-28
FISCAL YEAR - JULY 1st to JUNE 30th
NOTE - OPERATING EXPENSE - ALL DEPARTMENT EXPENSE OTHER THAN LAND PURCHASES AND PERMANENT IMPROVEMENTS.
NOTE:- CAPITAL EXPENDITURES - PURCHASE OF LANDS, FISH HATCHERIES, GAME FARM CONSTRUCTION AND PERMANENT IMPROVEMENTS.
1924-25
BALANCE RECEIVED FROM PRECEDING YEAR (GENERAL REVENUE)
$593,660.50
RECEIPTS DURING FISCAL YEAR
$433,264.60
$453,305.86 - TOTAL EXPENDITURES FOR YEAR
$224,356.78 - OPERATING EXPENSE
$228,949.08 - CAPITAL EXPENDITURES
TOTAL CASH AVAILABLE FOR FISCAL YEAR $1,028,925.16
1925-26
BALANCE RECEIVED FROM PRECEDING YEAR
$575,619.30
RECEIPTS DURING FISCAL YEAR
$438,174.37
$393,491.45 - TOTAL EXPENDITURES FOR YEAR
$300,602.13 - OPERATING EXPENSE
$92,889.32 - CAPITAL EXPENDITURES
TOTAL CASH AVAILABLE FOR FISCAL YEAR - $1,013,793.67
1926-27
BALANCE RECEIVED FROM PRECEDING YEAR
$620,302.22
RECEIPTS DURING FISCAL YEAR
$423,788.11
$851,517.36
$369,862.92 - OPERATING EXPENSE
$481,654.44 - CAPITAL EXPENDITURES
TOTAL EXPENDITURES FOR YEAR - TOTAL CASH AVAILABLE FOR FISCAL YEAR - $1,044,090.33
1927-28
BALANCE RECEIVED FROM PRECEDING YEAR
$192,572.97
RECEIPTS DURING FISCAL YEAR
$486,871.48
TOTAL CASH AVAILABLE FOR FISCAL YEAR - $679,444.45
$613,774.10 - TOTAL EXPENDITURES FOR YEAR
$360,427.63 - OPERATING EXPENSE
$253,346.61 - CAPITAL EXPENDITURES
$100,000
200,000
300,000
400,000
500,000
600,000
700,000
800,000
900,000



The state game farms were understood to be in process of reorganization. None were visited. Pheasants costs at Yorkville are understood to run 1.50 per bird for feed and labor.

The two public shooting grounds for waterfowl were not visited, but represent a move in the right direction. What management is practiced on them is not known.

27. Bond Issue. It is understood that the $20,000,000 bond issue which failed of popular ratification last fall, provided for acquisition expenditures for uplands, lowlands, and miscellaneous in the ratio of 2½, 1, and ½ respectively. This intrinsically meritorious idea might meet with better popular support if its objectives were made more specific and its allocation of acreage to counties less so. As to ofjectives, the following technical findings of this report are pertinent to the formulation of an acquisition program by the state:

(1) State forests, serving incidentally as refuges for turkey, deer, and ruffed grouse, are thoroughly practicable and badly needed.

(2) Slough and swamp lands for pheasant and prairie chicken refuges are thoroughly practicable and badly needed.

(3) Waterfowl areas, land and water, a part to be set aside as refuges, and a part to be set aside and managed as public shooting grounds, are thoroughly practicable and badly needed.

(4) Publicly owned quail refuges, and publicly owned shooting grounds for quail, are of doubtful practicability because of the short cruising radius of the species (and hence the low radius of drift from the refuge), and the low per acre populations as compared with per acre land costs.

Quail refuges incidental to 1, 2, and 3 are all right.

No attempt is here made to deal with acquisition of land for park and playground functions.

28. History of Open Seasons. This is given in Chart Q.

While not a matter of primary importance, Illinois is to be commended for the stability of her policy on seasons. The record is free of the minor tinkering which passes for game administration in many states.

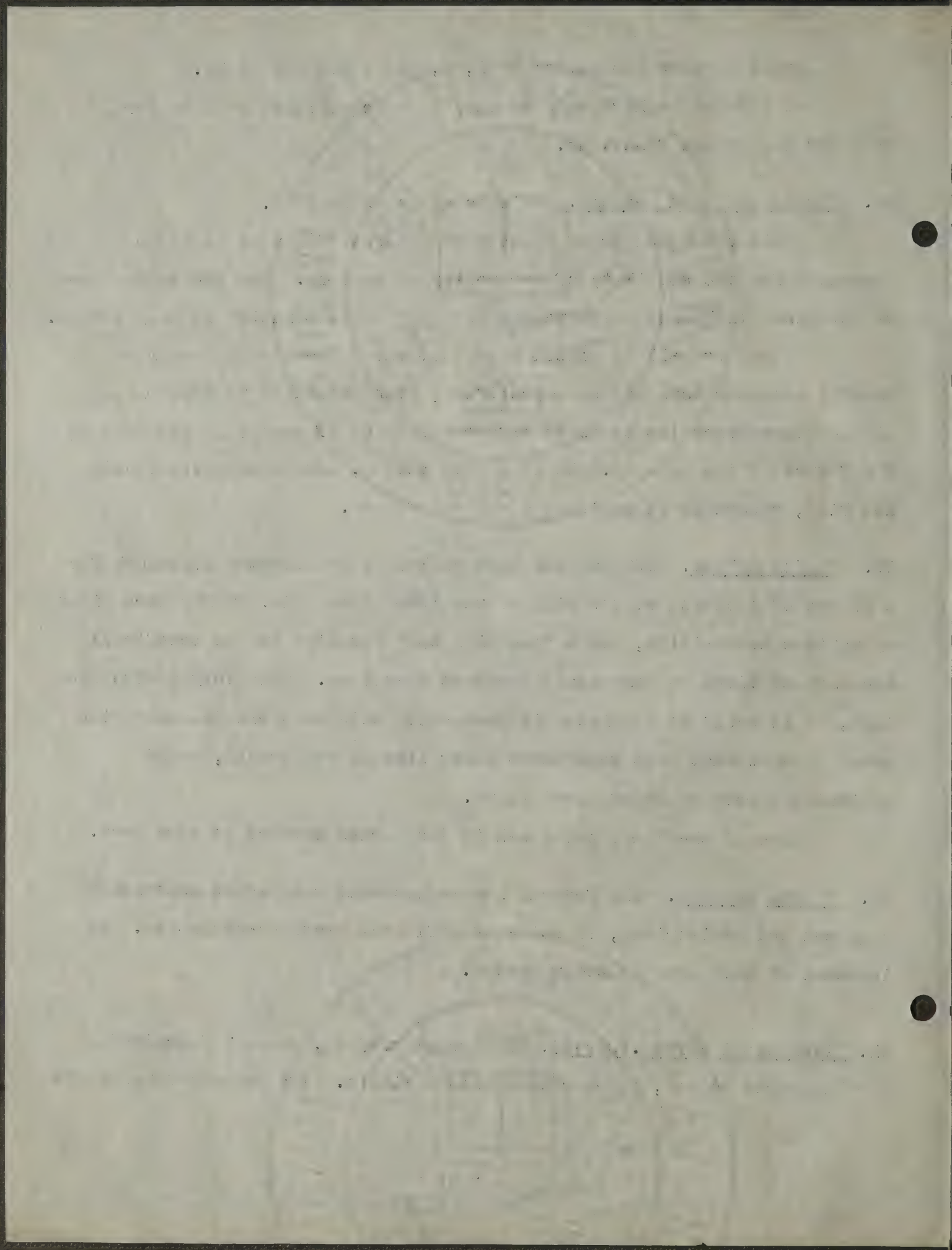
It may be well to repeat here that the present open season on prairie chickens does not seem justified, even though it is probably of little consequence (as compared with elimination of cover) in determining the future of the species. It is a late season, with a correspondingly low kill, otherwise it would be a serious factor.

29. Warden School. 150 wardens were called in by Director Radebaugh for a course of training at the time of the 1928 State Fair. Talks were given by various authorities, and a "question box" resulted in the beneficial exchange of views on many administrative questions. This very meritorious idea, if it could be continued in connection with suitable demonstration areas to show what game management looks like on the ground, would ultimately prove to be of great value.

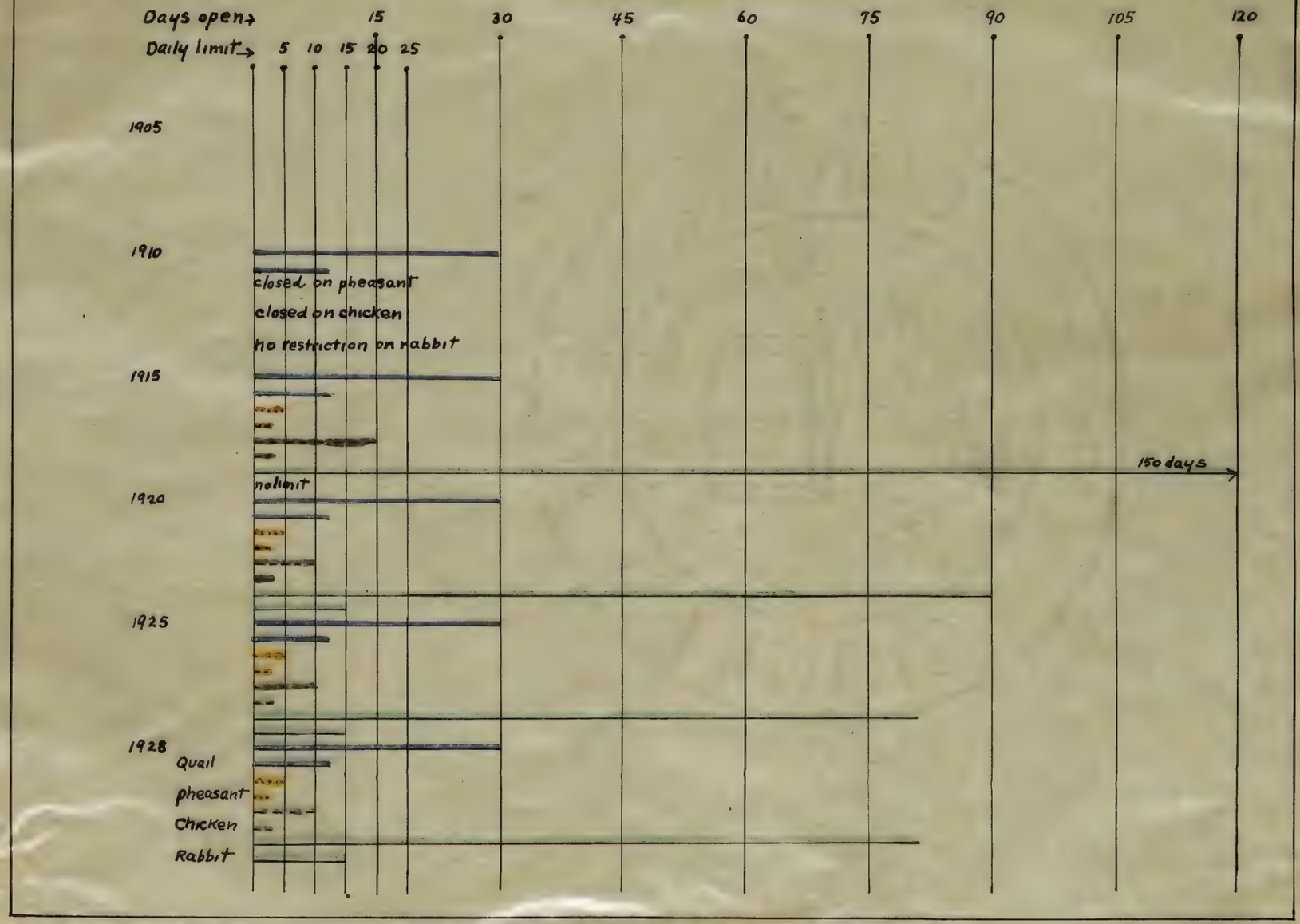
Some of the field personnel in the warden service is very good.

30. Federal Wardens. The federal law enforcement work seems especially vigorous and meritorious, in spite of deficient state co-operation. An increase of personnel is badly needed.

31. Mississippi Refuge.(Upper). This great project, already described in the Minnesota Report, extends down into Illinois. Its potential value and



## Chart Q Open Seasons & Bag Limits on Upland Game - Illinois



importance is little appreciated, even in the communities which will most directly benefit.

32. Forestry Division. Illinois has no state forests, although there is both a state Forester in the conservation department at Springfield and an extension forester in the Natural History Survey at the State University. These men have done valuable investigative and educational work, but the formulation and execution of a state forest program calls for a continuity of policy and a desire for long-time as well as short-time results which cannot exist with the conservation department organized as it now is.

The rudiments of a fire control organization have been built up in southern Illinois, but financial support has been sporadic, as is naturally the case in an unstable department.

The forestry appropriation is understood to have been recently cut in half.

In a broad way, forestry leadership by the state has gone about as far as it can under an unstable department.

There is a strong interest in actual forestry practice in certain localities. The Burlington Basket Company has been profitably raising timber on the Mississippi overflow islands for many years (incidentally offsetting its carrying costs by a substantial income from game rentals). E. L. Karraker is practicing forestry on his lands in Union County, held to produce raw material for his box-veneer plant at Jonesboro. He has no doubts about it being the most profitable way to handle his timber. In both these instances the fact stands out that the point of view is what counts most. These men make it profitable mostly because they want it to be.

(E) Game Research and Education in Illinois.

33. Research Agencies. The University of Illinois, including the Agricultural College and the Natural History Survey, has long been prominent in zoological research. All of this research is of foundational value to game management; some of it is of direct value, especially such work as Forbes & Gross, "An Ornithological Cross Section of Illinois" (1907) and Cahn's paper, now in press, on the relation of quail and pheasants. Much valuable work on the pollution problem has centered here.

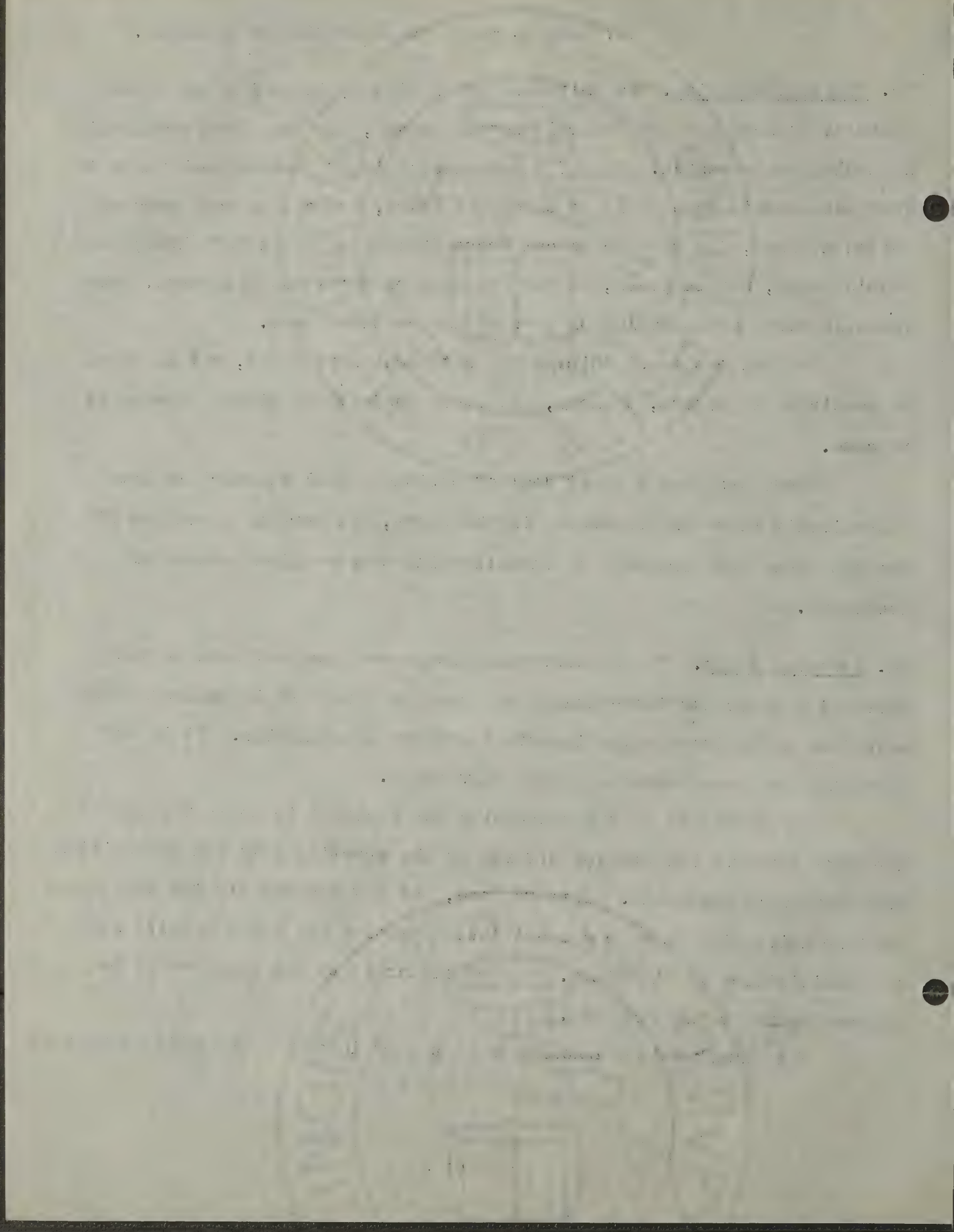
The University of Chicago has not been visited yet, but is known to be strong in botany, ecology, and other subjects of direct importance to game.

There has been a great deal of ornithological research in both these institutions and elsewhere in the state, but here as elsewhere it has not taken the direction of investigating conservation methods or technique.

34. Research Funds. The Conservation Department does not lean on the university to do its fact-finding on game, although it is understood to have done so on the equally important problem of pollution. It is not financing any game research at the university.

The president of the university has declined to apply for one of the Game Research Fellowships offered by the Sporting Arms and Armmunition Manufacturer's Institute. This was one, but not necessarily the only means for the university to make a start toward meeting its large unfulfilled responsibilities in the field. Direct financing by the state would be another means to the same end.

The Izaak Walton Foundation is a very important potential source of



game research funds.

At present it may be fairly said that the state is spending around a quarter of a million dollars, and its citizens a probably larger sum, on game conservation methods, practically none of which have passed scientific tests as to their efficiency, and some of which are almost certainly an entire waste. (The continued planting of pheasants in southern Illinois will suffice as a single example of continued waste). The investment in research work of a small percentage of the large sum now spent on game would be cheap insurance against the indefinite continuance of wasteful and unsuccessful practices. Agriculture, forestry, or industry would by no meas tolerate what now passes unchallenged as "game protection."

One serious aspect of delaying game research is that it takes a long time to solve game problems, or even to organize to solve them. It is by no means to be expected that a state university which has never functioned on game should function on a large scale or high speed on short notice. The coordination of many and varied departments is involved in the solution of every problem.

35. Research Projects. The number of urgent problems demanding answers is very large, and each of them is so intermeshed with other game problems, and with problems in agronomy, livestock, agricultural engineering, land economics, and forestry, that a mere list does not do justice to their importance. However, a list of the more urgent problems is here offered, with the request that the reader refer to the preceeding text for the various inter-relationships:

1. What kind and location of brush, tree and grass cover on the average Illinois farm offers the greatest benefit from game and insectivorous birds, erosion control, and wind protection, and the least loss in land area or harborage of noxious insects?

2. Given this cover, what methods of winter-feeding and predator control produces a maximum quail crop? How much of it can be safely harvested? When and how?
3. On what Illinois soils can pheasants be established in a wild state? Hungarians? Why? What effects do cover, feed, predators, and shooting have on the crop? What is their relation to agricultural crops and pests and to native game?
4. What is the radius of effectiveness of a pheasant refuge? A prairie chicken refuge? What lands are suitable?
5. On what Illinois lands do mallards fail to breed? Why? By what methods can local breeding stocks be reestablished?
6. What fluctuations occur in Illinois rabbit populations? Why? What is the human tularemia risk? Can that risk be rated or predicted as to time and place? Does tularemia affect other game?
7. What combination of game, fur, fish, and timber culture will make overflow lands most productive? What lands belong in this class?
8. What effects do various populations of housecat, crow, fox, and skunk have on game and poultry? On other useful birds?

Anyone of these projects, and especially the first one, involves numerous others. For instance, the first one involves the following:

1a. How can quail coverts and erosion control best be combined?
1b. Can chinch-bug harborage be avoided by placing quail coverts on the north sides of hills, banks, or woodlots? What brush species offer the least harborage to chinch-bugs and the most to quail?
1c. Does the chinch-bug harborage offered by quail coverts offset the benefit to clover seed from harboring bumble-bees? Where?

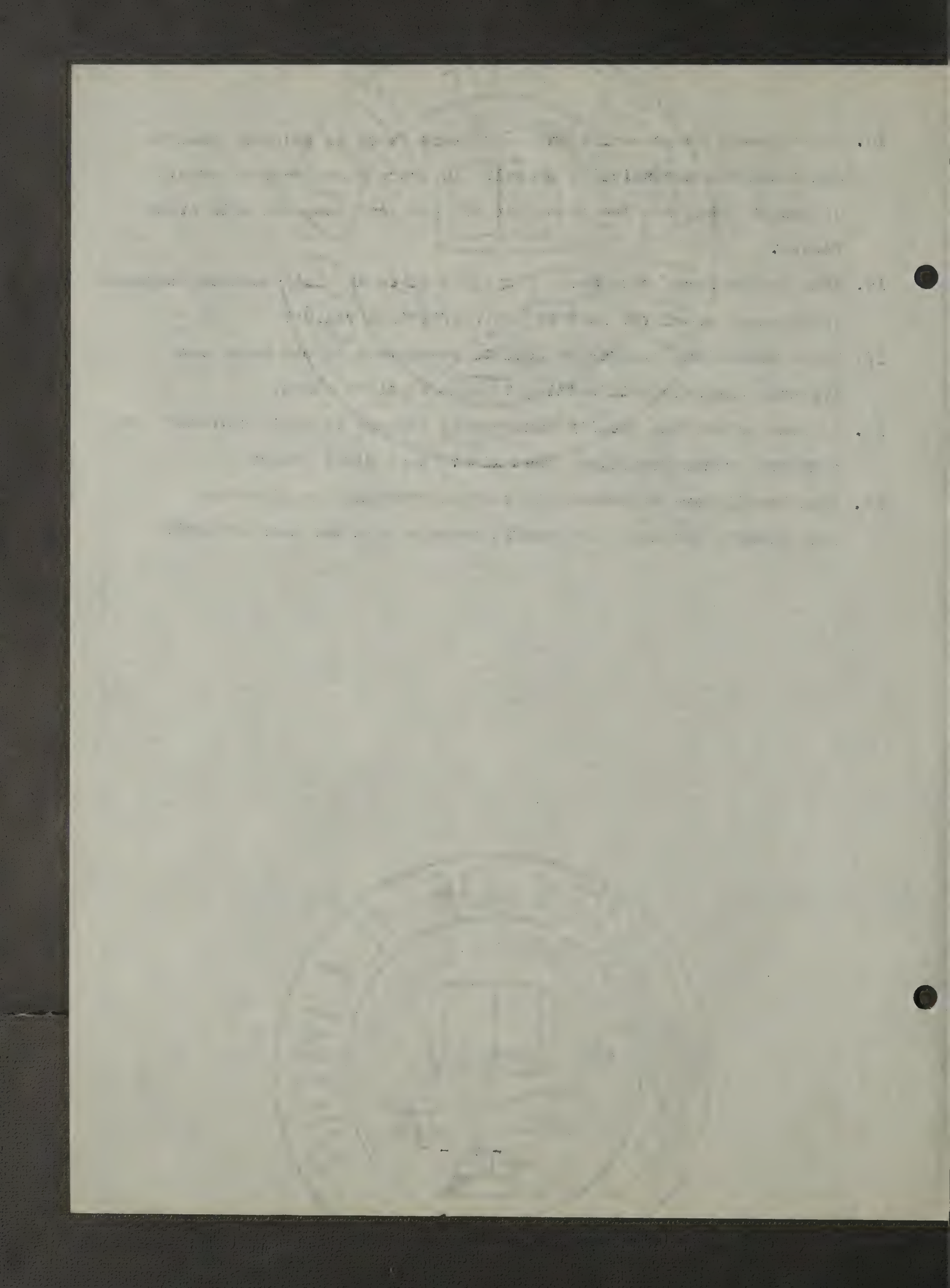
1d. Is the osage hedge really an inefficient fence if properly planted and laced and mechanically pruned? Is there a scale-proof strain of osage? What are the costs per rod per year compared with other fences?

1e. What is the farm importance of syrphid flies and lady-beetles harbored in ingrazed woodlots? What is their effective radius?

1f. Can a mechanical planter be used to revegetate stream banks and drainage channels with cuttings? What species? When?

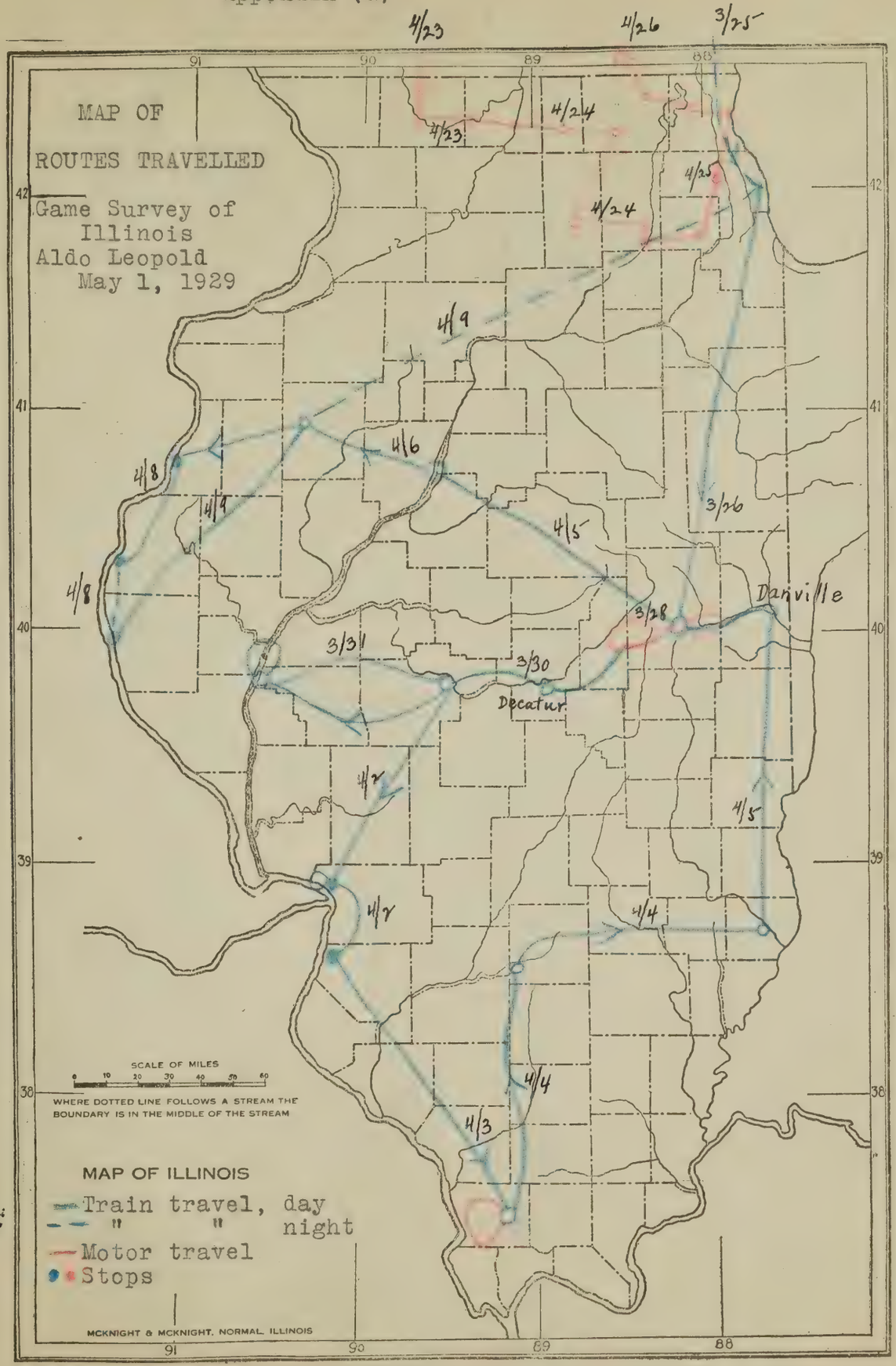
1g. To what extent can quality make up for acreage in quail coverts? Are conifers groups feasible? What kind? What size? Where?

1h. What benefit are windbreaks to various cropping and livestock operations? How does the benefit compare with the loss of land?



# III. A P P E N D I X

Appendix (a)


MAP OF
ROUTES TRAVELLED
Game Survey of
Illinois
Aldo Leopold
May 1, 1929
4/23
4/26
3/25
4/24
4/25
4/9
4/6
4/8
4/7
4/5
3/26
3/28
Danville
3/31
3/30
Decatur
4/4
4/3
SCALE OF MILES
0 10 20 30 40 50 60
WHERE DOTTED LINE FOLLOWS A STREAM THE BOUNDARY IS IN THE MIDDLE OF THE STREAM
MAP OF ILLINOIS
Train travel, day
" " night
Motor travel
Stops
MCKNIGHT & MCKNIGHT, NORMAL, ILLINOIS
91
90
89
88
42
41
40
39
38

Appendix (b)

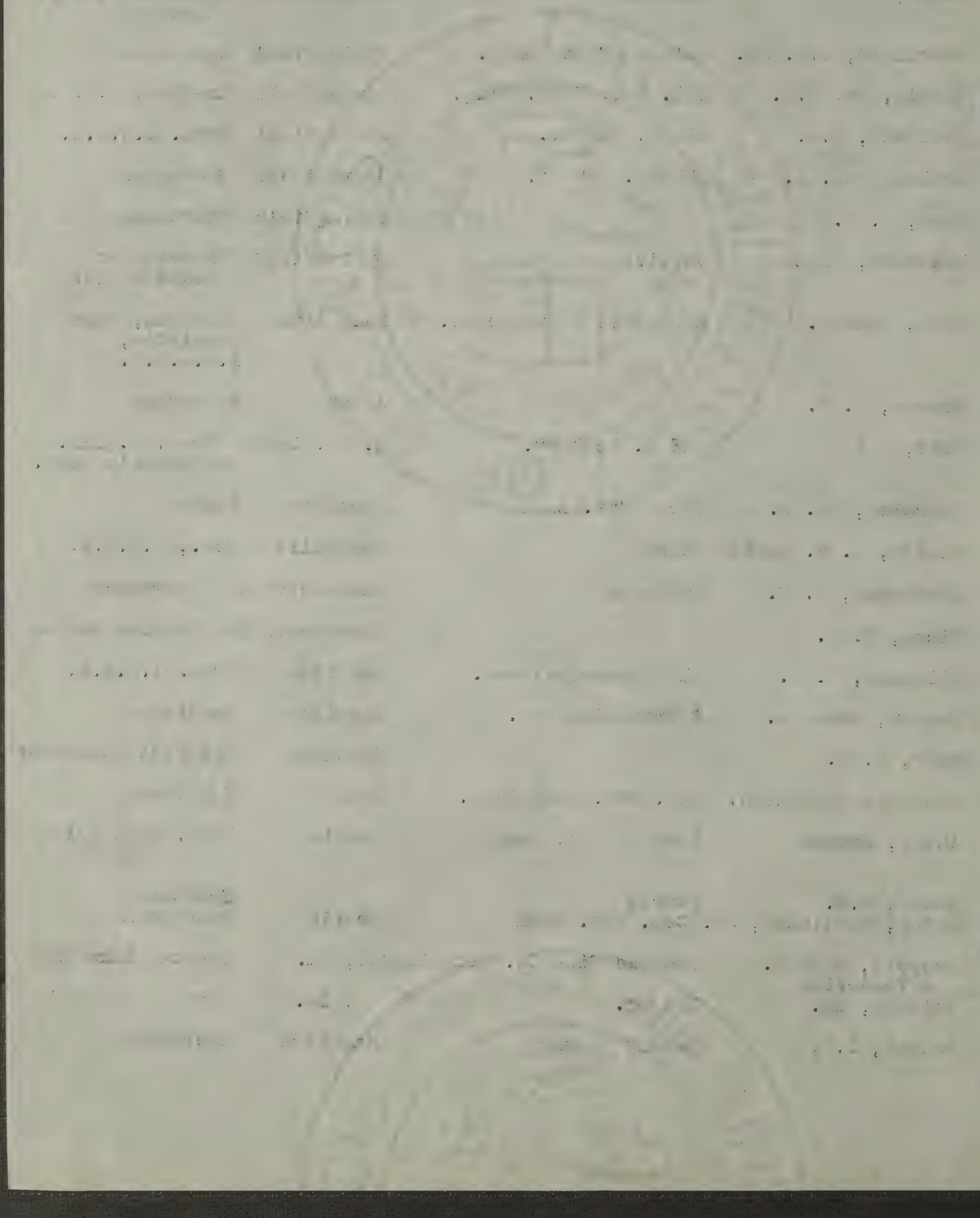
Persons Consulted - Game Survey of Illinois

March 26 - April 26, 1929

| Name | Address | City | Capacity |
|---|---|---|---|
| Ward, Dr. Henry B. | Natural History Bldg. | Urbana | Pres. I.W.L.A. Head of Zoology, U. of Ill. |
| Cahn, Dr. Alvin R. | " | " | |
| Forbes, Dr. Stephen A. | " | " | Chief, Natural History Survey |
| Mueller, Wm. S. | (Agric. College, U. of Wis.) | Shelbyville | Grad Student, U. of Wis. |
| Pickel, Geo. W. | 202 Highway Lab. | Urbana | Drainage Engineering |
| Gerber, W. D. | 57 Chemistry Bldg. | Urbana | Sanitary Engineering |
| Smith, R. A. | 208 New Agric. Bldg. | Urbana | Soils |
| Metcalf, C. E. | Old Law Building | Urbana | Entomologist |
| Leighton, M. M. | 305 Ceramics Bldg. | Urbana | State Geologist |
| Hottes, Dr. Chas. F. | Natural History Bldg. | Urbana | Head, Botany Dept. |
| Regal, William | | Tolono | Farmer |
| Radebaugh, Gus H. | 701 West Elm St. | Urbana | Ex-Director of Conservation |
| -------Lodge | | Monticello | Farmer |
| Leuth, Walter F. | 18 Taylor St. | Champaign | Spc. I.W.L.A. |
| Willis, H. T. | G.C.Willis Store | Champaign | Sportsman |
| Miller, R. B. | Capitol | Springfield | State Forester |
| Phelps, Roy L | | Beardstown | District Game Inspector |
| Lashbrook, Fred | | Meredosia | Game Warden |
| Hamilton, Arthur | | Meredosia | River Guide or "Pusher" |
| ---------Sparks | | Meredosia | Fish Station |
| Bane, Dr. Fred W. | 1409 N. 9th | Springfield | Hopkins Hospital |

Persons Consulted - Game Survey of Illinois (cont'd)

| Name | Address | City | Capacity |
|---|---|---|---|
| Lewis, A. D. | Capitol | Springfield | State Director of Minerals |
| Mansfield, C.F.,Jr. | Leland Office Bldg. | Springfield | Sportsman |
| Tuttle, Dr. H.H. | Ill. Nat. Bank. Bldg. | Springfield | Ex-Pres. I.W.L.A |
| Oldfield, S.A. | 111 S. 5th St. | Springfield | Pres. I.W.L.A. |
| Dunlap, Geo. A. | 1716 S. 5th St. | Springfield | Sportsman |
| Knox, J. H. | | Springfield | Sportsman |
| Bradford, Ralph | Capitol | Springfield | Director of Conservation |
| Olin, John M. | % Western Cartridge Co. | East Alton | Chariman, Game Committee, S.A.A.M.T. |
| Bowman, H. J. | | Alton | Sportsman |
| Huff, N R | 528 N. 26th St. | E. St. Louis | Pres. S. Ill. Sportsmen's Assn. |
| Karraker, Ed. C. | First Nat. Bank | Jonesboro | Farmer |
| Miller, C. R. Spadts | Store | Centralia | Sec., I.W.L.A. |
| Abernathy, D. R. | Hardware | Lawrenceville | Sportsman |
| Hicks, H. H. | | Lawrenceville | Ex-Game Warden |
| Williams, H. R. | 514 Commercial Ave. | Danville | Pres. I.W.L.A. |
| Sparks, Chas. A. | 8 Cronkhite Ave. | Danville | Sportsman |
| Huff, C. E. | | Danville | District Inspector |
| Heidrich, Arthur G. | Com. Nat. Bank Bldg. | Peoria | Sportsman |
| Luthy, George | Central Nat. Bank | Peoria | Pres. Duck Island Club |
| Baker, M.M. | Peoria | | Sportsman |
| Luthy, Ferdinand, Jr. | Cen. Nat. Bank | Peoria | Sportsman |
| Leopold, Carl S. & Frederick | Leopold Desk Co. | Burlington, Ia. | Crystal Lake Club |
| Ewinger, Wm. | 3rd St. | " , Ia. | " " " |
| Dadant, L.C. | Dadant & Sons | Hamilton | Sportsman |



Persons Consulted - Game Survey of Illinois (con't)

| Name | Address | City | Capacity |
|---|---|---|---|
| Weber, J.J.,Jr. | Sporting Goods | Keokuk, Ia. | Alexandria Gun Club |
| Musselman, V.G. | Quincy Business College | Quincy | |
| Sutton, J. G. | Box 138 | Quincy | Drainage Engineer B.P.R. |
| Akester, Dr. John | 5101 Winona Ave. | Chicago | Sportsman |
| Rigney, Stephen | 609 S. State St. | Freeport | Dist. Game Inspector |
| Knowlton, Kenneth | Knowlton State Bank | Freeport | Sportsman |
| _____ McClure | | Seward (?) | Farmer |
| Tull, Dr. R.E. | Rockford N.B.Bldg | Rockford | ex-Pres. Rockford I.W.L.A. |
| Williams, J.C. | Burr Sporting Goods | Rockford | Sportsman |
| Rowan, Warren | | Belvidere | Dist. Game Inspector |
| Adams, Dr. J.M. | | Belvidere | Pres. I.W.L.A. |
| Wilson, Jack | | Marengo | Farmer |
| _____Wetzel | Wetzel Jewelry Store | Sycamore | Pres. I.W.L.A. |
| Wyman, B.A. | Furniture | Sycamore | Sportsman |
| Rehm, Percy R. | Florist | St. Charles | Sportsman |
| Warren, Paul | Baker Hotel | St. Charles | Sportsman |
| _____Evans | | St. Charles | Evans Game Farm |
| Van Burton | | Butaven | Sportsman |
| Korsgard, Arthur | | Des Plaines | Cook Co.Forest Preserve |
| Kennicott, Harrison | | Des Plaines | Sportsman |
| Brewer, W.C. | Route 1 | Grays Lake | Farmer |
| Sargent, E.T. | Hardware | Waukegan | Pres.I.W.L.A. |
| Stevens, J.P. | | Waukegan | Sportsman |
| Nodelhoffer, Joe | | Guerney | Farmer |
| Graham, J.R. | | Ingleside | Hercules Powder Co |
| Hughes, Frank | | Ingleside | Sportsman |
| Eldredge, Chas. | | Richmond | Dist. Game Inspec. |
| Wakeley, Guy | Clothing Store | Harvard | Pres. I.W.L.A. |

Appendix (c)

Persons Missed - Game Survey of Illinois.

March 26 - April 26, 1929

| Name | Address | City | Capacity |
|---|---|---|---|
| Buswell, A.M. | 57 Chemistry Bldg. | Urbana | Sanitary Engineer |
| Shelford, V E | | Urbana | Natural History Survey |
| Telford, C.J. | 213 New Agric. Bldg. | Urbana | Extension Forester |
| Lloyd, J.H | | Carthage | County Agric. Agent |
| Musselman, T.E. | Quincy Business College | Quincy | Ornithologist |
| Stratton, Wm. | | Ingleside | ex-Director of Conservation |

Appendix (d)

Bibliography

(Note: This does not purport to be a complete list of the references pertinent to the subjects discussed. It is merely a list of those encountered and used as sources of facts.)

Ornithology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(4) Forbes, S. A. 1907. "An Ornithological Cross-Section of Illinois in Autumn."

(5) Woodruff, F. M. 1907. "Birds of the Chicago Area." Natural History Survey.

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(7) Forbes, S. A. & Gross, A. O. 1923. "On the Numbers and local Distribution of Illinois Land Birds of the Open Country in Winter, Spring, and Fall." Natural History Survey.


Soils, Geology, Drainage, Agriculture.


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Appendix (e)

Digest of "Numbers & Local Distribution of Ill. Land Birds"

By Stephen A. Forbes & Alfred O. Gross

(Bulletin of Natural History Survey Vol. XIV, Art. X, October 1923)

(Field Work 1906-9)

Acreage Covered & Numbers All Birds per Sq. Mi.

| | Winter | | Spring | | Summer | | Fall | |
|---|---|---|---|---|---|---|---|---|
| | Acr. | No. | Acr. | No. | Acr. | No. | Acr. | No. |
| Southern | 1400 | 836 | | | | | | |
| Central | 2600 | 440 | | | | | 4500 | 4100 |
| Northern | 2300 | 420 | | | | | 1756 | 1458 |
| State | 6400 | 520 | | | | | | |

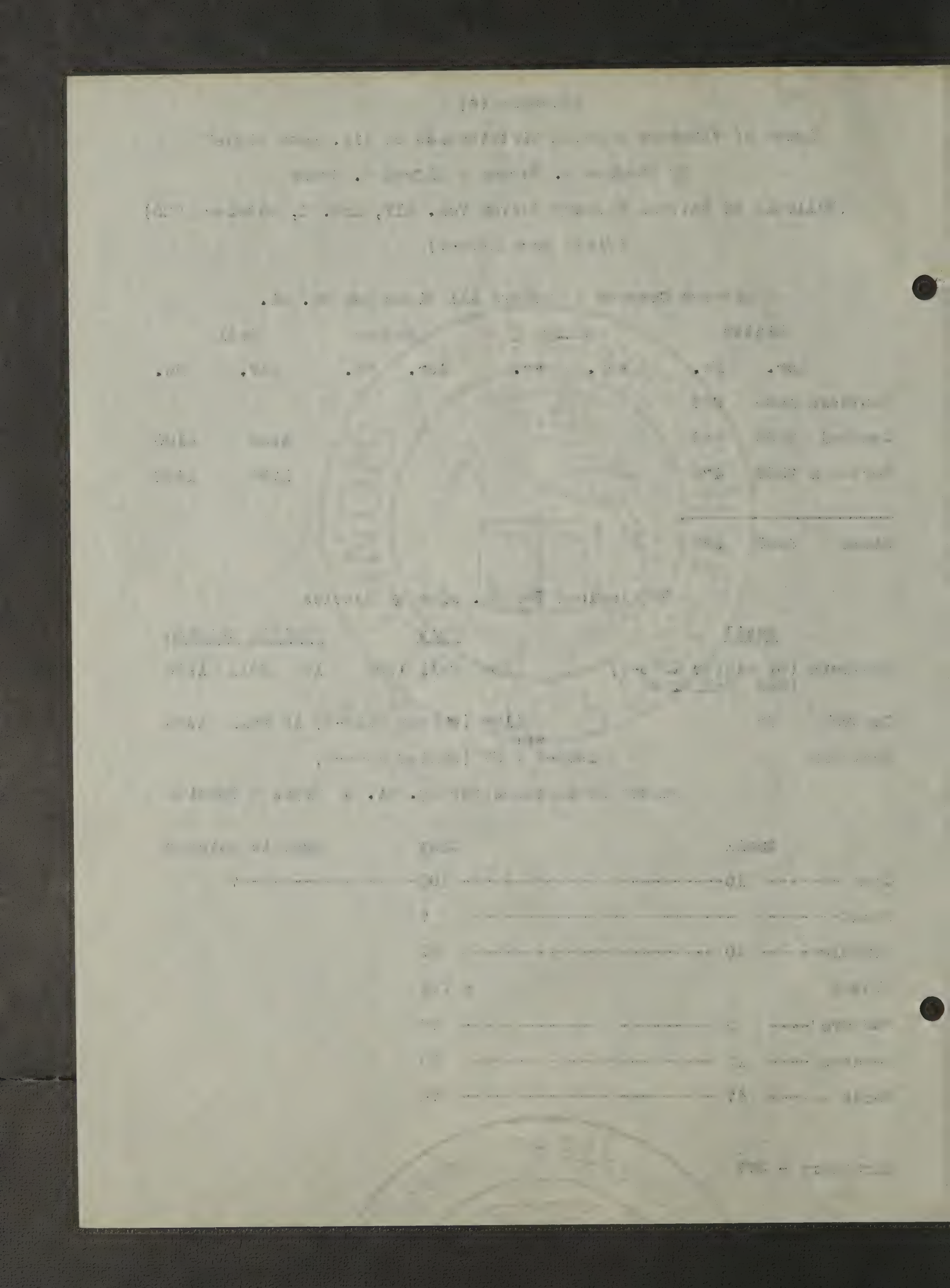
Populations Per Sq. Mile by Species

| | Quail | Crow | Prairie Chicken |
|---|---|---|---|
| Southern | (81 winter 1906-7)<br>(365 fall 1906 | 380 fall 1906 | 19 fall 1906 |
| Central | 72 | (128 (winter 1906-7) | 12 fall 1906 |
| Northern | 95( 1906-7 | ( 57 (winter 1906-7) | |

Winter Populations Per Sq. Mi. by Types & Species

| | Quail | Crow | Prairie Chicken |
|---|---|---|---|
| Corn | 16 | 183 | 7 |
| Wheat | | 7 | |
| Stubble | 40 | 69 | |
| Plowed | | a few | |
| Pasture | 9 | 27 | |
| Meadows | 19 | 23 | |
| Woods | 47 | 74 | |

Shrubbery - 377



| | Quail | Crow |
|---|---|---|
| Waste & Fallow | 115 - - - - - - - - | 90 |

Proportion of Total Birds

| | | |
|---|---|---|
| Prairie Chicken | 2.2% | Bloomington to Champaign March 1907. |
| " " | 3.6% | Waukegan to Scales Mound " " |
| " " | 2.0% | Harvey to Grant Park " " |
| Quail | 7.0% | Lawrenceville to Brownsville April 1907 |
| Crow | 1.2% | " " " " |

Numbers Per Square Mile of All Winter Birds in the Several Habitats

| Habitats | Southern Illinois | Central Illinois | Northern Illinois | State |
|---|---|---|---|---|
| Corn | 1384 | 482 | 211 | 494 |
| Wheat | 131 | 69 | 271 | 423 |
| Stubble | 529 | 252 | 540 | 417 |
| Plowed ground | 105 | 315 | 86 | 218 |
| Pasture | 569 | 498 | 349 | 446 |
| Meadow | 554 | 74 | 405 | 319 |
| Swamp | 1207 | ... | ... | ... |
| Orchard | 2187 | 548 | ... | 1354 |
| Woods | 1591 | 679 | 447 | 1239 |
| Shrubs | 2011 | 4391 | 891 | 2133 |
| Waste & Fallow | 555 | 1989* | 831 | 1013 |
| Yard & Gardens | 782 | 17550# | 1041 | 3995 |
| Miscellaneous | 81 | 469 | 368 | 328 |

*Mainly tree sparrows.
#English sparrows only.

Quail

Crow

Waste & Fallow 115 - - - - - - - - 90

Proportion of Total Birds

| | | | |
|---|---|---|---|
| Prairie Chicken | 8.2% | Bloomington to Champaign March 1907. | |
| " " | 3.6% | Wenkegan to Scales Mound " " | |
| " " | 2.0% | Harvey to Grant Park " " | |
| Quail | 7.0% | Lawrenceville to Brownsville April 1907 | |
| Crow | 1.2% | " " " | " |

Numbers Per Square Mile of All Winter Birds in the Several Habitats

| Habitats | Southern Illinois | Central Illinois | Northern Illinois | State |
|---|---|---|---|---|
| Corn | 1384 | 482 | 211 | 494 |
| Wheat | 131 | 69 | 271 | 423 |
| Stubble | 329 | 252 | 540 | 417 |
| Plowed | | | | |
| Ground | 105 | 315 | 86 | 218 |
| Pasture | 589 | 498 | 349 | 446 |
| Meadow | 554 | 74 | 405 | 319 |
| Swamp | 1207 | ... | ... | ... |
| Orchard | 2197 | 548 | ... | 1384 |
| Woods | 1591 | 879 | 447 | 1239 |
| Shrubs | 2011 | 4391 | 891 | 2183 |
| Waste & | | | | |
| Fallow | 555 | 1989* | 831 | 1013 |
| Yard & | | | | |
| Gardens | 782 | 17550‡ | 1041 | 5995 |
| Miscellan- | | | | |
| eous | 81 | 469 | 368 | 329 |

*Mainly tree sparrows.
‡English sparrows only.

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